"TRAIN UP A CHILD"

ROBERT BLAKE McVITTIE, M.D.

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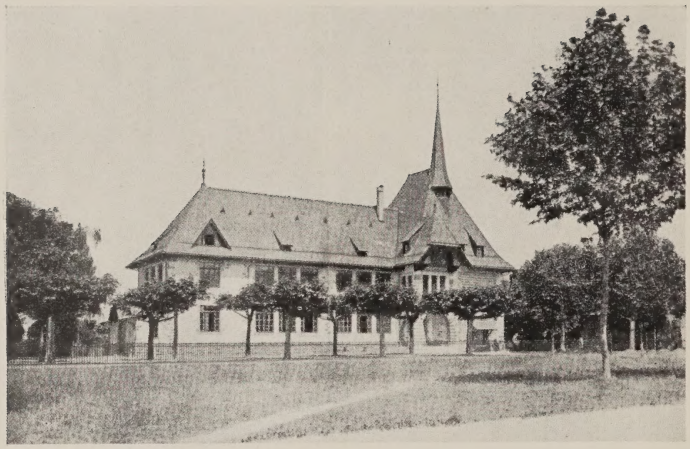

ONE OF THE MANY ARTISTIC SCHOOL BUILDINGS TO BE SEEN IN SOME SWISS CANTONS MORE THAN TWENTY YEARS AGO (see p. 172).

[*Frontispiece.*

"TRAIN UP A CHILD..."

BY ROBERT BLAKE McVITTIE, M.D.

LONDON
JOHN MURRAY, ALBEMARLE STREET, W.
1926

TO

MY WIFE

WITHOUT WHOSE PATIENCE AND OPTIMISM MUCH OF THIS WORK WOULD NEVER HAVE SEEN THE LIGHT

INTRODUCTION

In publishing these papers it has been the aim of the author to deal with the subject in a popular and practical manner, and if at times he has been obliged to trespass on the domain of Science, it has only been to illustrate as briefly as possible the *raison d'être* of some point which otherwise might have seemed obscure or even misleading. Statements of fact are often not easily retained in the memory, but if we understand the relationship and causes in operation the impressions are much more likely to be permanent, and there is a better prospect of being able to adjust ourselves to any unusual combination of circumstances which may arise unexpectedly. Repetitions have sometimes been unavoidable to maintain the continuity of ideas, but perhaps more often intentional where an important point might be overlooked or forgotten.

We are told that "the reading of history makes men wise," and undoubtedly a wise man will learn wisdom from everything, and as human nature is fundamentally identical in all ages of the world those who will be warned by the errors into which their ancestors have fallen will gain much experience and save themselves much suffering by a thoughtful perusal of its pages.

It might, therefore, reasonably be expected

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that in approaching so formidable a subject as the training of the child we ought to examine its historical origin and growth, and just here it would be well to state plainly that throughout these papers the words Training, Education and Health are to be understood as comprehending the physical, mental and spiritual development of the individual.

But man is, or ought to be, essentially a progressive being, endowed with a capacity for selective appropriativeness, and slowly, but upon the whole steadily, accumulates knowledge and power in proportion as he operates along the lines of universal law, in which direction alone we may reasonably hope to find the Eldorado of universal happiness and peace: for, the Divine force, which pervades all creation, seeks in all things this grand ultimatum, and all physical science shows that all Nature is striving towards harmony and equilibrium, and that everywhere around us love, joy, peace, gentleness, meekness, goodness, temperance are vibrating in responsive chords with energy and strength, growth and development; and that the contrary conditions of envy, hatred and malice arrest assimilation, are destructive to tissue, prevent growth and development, and scatter broadcast around us death and destruction.

Throughout almost the entire course of Darwin's most thoughtful and painstaking researches, there appear to be two prominent points maintained, viz. the survival of the fittest, and the persistence of any modification that is found to be of advantage to the species.

Now what do we mean by the fittest, and why should a modification of advantage persist any more than one which is a disadvantage? Surely the answer is not far to seek. The fittest are those who live most in harmony with universal law, and the modification of an advantageous nature persists for the same reason; in other words universal law and universal life are correlative, and the design of the universe is progress.

For our own part, while we value very highly the advantages derived from the perusal of history, we feel that most of its useful experiences have become absorbed, and, like the survival of the fittest, are daily expressing themselves in the more or less concrete form of action, and that to give disproportionate attention to the proceedings of our ancestors, who must have acted under somewhat different combinations of circumstances from those in which we are now placed, is very much like the man who preferred to go to his bedroom by a ladder than a staircase, because the ladder was the older institution and had been used with the scaffolding when the house was being built. We must say that we prefer the staircase, and, in a similar spirit, we feel that our time is better spent in dealing with the problems of the day, than with those of antiquity.

In earlier times it was essential that all those who would desire to prosecute research must of necessity obtain a considerable mastery of the dead languages, as in them were locked up the experiences of past generations, which

became lost during that painful period of the world's history known as the Dark Ages.

As, however, methods of communicating and recording not only all the experiences derived from this source, but also those arising in our own time, improved, this necessity has now ceased to exist, and although it would doubtless be most desirable that Man should possess all knowledge, if it were possible, for knowledge' sake, yet we must remember that " Art is long and time is fleeting," and that it behoves us, when forced to make a choice, to strive as much as possible to accumulate such knowledge as we may reasonably hope will bear the most fruit in practical benefit to the community at large.

It will then, we think, be readily appreciated, that undue contemplation of a remote past, of the cruelties and ignorance of our pagan ancestors, of their extravagances and vices, and of their strange systems of reasoning, upon the humours to which they attributed the origin of disease, and of their complicated systems of philosophy, cannot be productive of much benefit ; and we would strive, as far as our capacity for condensation may permit, to set forth a few of those conditions which we believe are militating against our progress, and to suggest such remedies as we hope may be deemed to be within the range of " practical politics " ; we will therefore endeavour to :

> " Let the dead past bury its dead,
> Act, act in the living present,
> Heart within and God o'erhead."

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GLOSSARY

ACTINOMYCOSIS.—A chronic infectious disease of cattle, sometimes transmitted to man, characterised by the formation of lumpy tumours on jaws and tongue, and may also develop in the viscera, bone and skin.

ÆTIOLOGY.—The study of the causation of any disease.

ALA.—Any winglike process, *Alæ nasi*, the cartilaginous flaps at the outer sides of the nostrils.

ALVEOLAR.—Any pit or socket, usually refers to socket in the jaw for the root of a tooth.

ANOXÆMIC or ANOXYÆMIC.—Deficient oxygen in the blood.

ATELECTASIS.—Imperfect expansion of the lungs at birth; partial collapse of the lung.

BOLUS.—A rounded mass frequently used to describe a mouthful of food.

CHLOROTIC.—Pertaining to chlorosis—green sickness, a form of anæmia frequently affecting girls about the age of puberty.

CYANOSIA.—Blueness of the skin due to cardiac malformation—insufficient oxygenation of the blood—extreme cold, etc.

ENDOTHELIUM.—The membrane that lines the serous cavities, blood-vessels, joints, etc., consisting of a layer of thin, flat, connective tissue cells.

GESTATION.—Pregnancy.

HYPERÆMIA.—Excess of blood in any part of the body.

INHIBITION.—Arrest or restraint of a process effected by nervous influence.

KYPHOSIS.—Humpback; abnormal curvature and dorsal prominence of the vertebral column.

LORDOSIS.—Curvature of the spinal column with a forward convexity.

MARASMUS.—Progressive wasting and emaciation, especially in young children, when there is no obvious cause.

MAXILLARY.—Pertaining to the jaws.

MENINGEAL.—Pertaining to the membranes of the brain and spinal cord.

METABOLISM.—The change produced in a substance by the

action of living cells upon it; the process by which living cells or organisms incorporate the matters obtained from food into a part of their own bodies.

NASO-PHARYNX.—The part of the pharynx above the soft palate.

NEURASTHENIA.—Nervous prostration; depression due to the exhaustion of nerve energy. It is usually due to prolonged and excessive expenditure of energy and is marked by tendency to fatigue, lack of energy, pain in the back, loss of memory, insomnia, constipation, loss of appetite, etc.

NEURON.—A nerve cell with its processes, collaterals and terminations regarded as a structural unit of the nervous system.

NEUROPATHIC.—Pertaining to or characterised by a nervous disorder.

PERISTALSIS.—The worm-like movement by which the alimentary canal propels its contents. It consists of a wave of contraction passing along the tube.

PERI-VASCULAR.—Situated around a vessel.

PROLIFERATION.—The reproduction or multiplication of similar forms, especially of cells.

PSYCHASTHENIA.—A functional neurosis marked by states of pathologic fear or anxiety, obsessions, fixed ideas, feelings of inadequacy and peculiar feelings of strangeness, unreality and dispersonalisation.

PTYALINE.—An unorganised ferment occurring in the saliva, converting starch into dextrose.

PUERICULTURE.—The art of rearing and training children.

PUERPERIUM.—The period or state of confinement; childbed.

PYLORUS.—The distal or duodenal aperture of the stomach; the aperture by which the stomach opens into the intestine.

SCLEROSIS.—An induration or hardening; especially hardening of a part from inflammation and in diseases of the interstitial substance.

SYNAPSE.—The contact or point of contact between dendrons (Dorland).

THRUSH.—Aphthous stomatitis; a disease of infants attended with the formation of aphthæ, or whitish spots in the mouth. It is due to the presence of a fungus.

TICS.—Spasmodic movements or twitches. They occur in persons of neurotic tendency; are often hereditary and usually develop in youth.

VACUOLE.—Any place or cavity formed in the protoplasm of a cell.

"TRAIN UP A CHILD . . ."

CHAPTER I

PRE-NATANT EXISTENCE

"The sins of the fathers are visited upon the children to the third and fourth generation."

I CAN quite understand that many of you would be disposed to think that these papers are uncalled for and are much ado about nothing. You will say that the British Empire is the greatest of all Empires, that the British people are the best of all peoples, and that they have nothing to learn from any foreign nation.

Now with the first two of these propositions I am in agreement. The British Empire is the greatest Empire in the world and the British people are a very fine people: they put down the slave trade; they received with open arms refugees flying from horrible persecutions; they have been pioneers in missionary work to the darkest places of the earth, and have shown many instances of noble sacrifice and dauntless perseverance in exploring unknown regions and facing immeasurable dangers and privations; and it is because of these excellent qualities

that we feel all the more that they are a people worthy of standing in the forefront of education and progress, and that they should be placed in the best possible position to maintain the traditions worthy of their ancestry; but we must remember that the history of Empires is not at all encouraging—they have risen and they have fallen, and every wise man who knows that history repeats itself will take steps to guard against those calamities which have brought such disastrous results upon others. Even in our own times we have seen Nemesis descend rapidly and unerringly upon our neighbours.

At the declaration of war in 1870, the French were marching through their country drumming and trumpeting and shouting, "A Berlin, A Berlin," but it was only as prisoners they arrived in Berlin.

In 1914 the Germans were shouting, "Nach Paris, Nach Paris," but it was only as prisoners they arrived in Paris. And the mighty Russian Empire with its hundreds of millions of people, its magnificent palaces, its extraordinary accumulation of art treasures, and its marvellous mineral and agricultural resources, is now but a scene of chaotic confusion and disorder.

"Pride goeth before destruction—a haughty spirit before a fall."

But with the third proposition I cannot at all agree, for if my experience counts for anything, I must say that I have always found the

greatest minds the most anxious to learn and the most humble and patient in doing so, and it certainly must be admitted that we cannot ignore the evidence of simple figures, especially if supported by experience of a number of years, and although we fully realise that figures of themselves can often be most misleading, yet we feel that figures taken in conjunction with the great mass of other evidence, will demonstrate to every reasonable mind that we are face to face with a problem of the greatest gravity. "Let him that thinketh he standeth take heed lest he fall."

Oliver Wendell Holmes, who was a deep thinker, tells us that if we would be healthy we must first procure healthy ancestors; but as we cannot control the past, we must try to make the present and the future a healthy past for those who would come after us, and in connection with the subject now under consideration, it is not too much to say that the education of a child should begin some years before it is born.

The awful verdict contained in our heading, demonstrated only too forcibly every day, would indeed be cruel if it were not equally true that the good deeds of the parents also bear fruit in many generations of their offspring. Some years ago we were acquainted with a father and mother who combined the highest musical talent with sound, practical

common sense, and were also gifted with very considerable literary ability; they had three sons, all of whom are now doing well in the world, and to whom literature and music are not only no trouble but a constant source of happiness and help to themselves and to those with whom they come in contact.

But as the whole have no need of a physician, it is not our intention to dwell upon the normal and healthy, but to direct our investigations to the causes underlying departures from this happy condition, that we may be enabled to suggest some means to avoid those sins, or errors against universal law, which have brought, and are still bringing, such fearful calamities upon the length and breadth of the human family. We have neither time nor inclination here to deal with those flagrant departures from the normal which constitute fully developed disease, but rather, feeling that prevention is much better than cure, we would point out such measures as we believe may enable the *Vis Medicatrix Naturæ* to set disease at defiance, and to maintain that normal reaction to environment which is generally understood by the term good health.

The fact that those who have taken upon themselves the responsibility of parentage have been quite content to "muddle through somehow" is only too clearly demonstrated in our hospitals, asylums, gaols and what are called

workhouses. The child and the man must ever be a great resultant of two principal groups of factors, the ante-natal and the post-natal. "By their fruits ye shall know them," and although in a few instances hereditary conditions may skip a generation, yet the ego physically, mentally and morally is but the focus of the blending of these two groups of factors, and the everyday expression, "a chip of the old block" shows how commonly we recognise the characteristics of heredity physically, mentally and morally.

Even the uneducated savage fully expects his offspring to present characteristics of feature and of figure somewhat reflecting its parentage, and it is sufficiently evident to the most thoughtless that we cannot gather grapes of thorns or figs of thistles. Yet every day we see people of education in our civilised communities indulging in courses of life which even the most degraded of them would not desire reproduced in their offspring. If you would have a good crop you must not only sow good seed, but have well-prepared soil.

"The child is the father of the man," and if we would have men deserving of the name, sound in principle, clear in intellect and vigorous in body, we must begin at the beginning. Kind Dame Nature, whose object seems to be to work towards perfection, will not tolerate indifference nor contempt for any of her processes so neces-

sary in elaborating this grand consummation. If, therefore, we would make the effort to glance even superficially at this great question we must, on the threshold, direct our attention to pre-natal existence.

This whole subject, so important at all times, has been brought home with greater force to the people of these countries by the intensity of the struggle which has so recently been enacted in Central Europe. It has begun to dawn upon the British people that their *laissez faire* method of " muddling through somehow " is not after all everything that could be desired. They begin to dimly comprehend, that the mere fact of being born on British soil of British parents, is not in itself enough to ensure that unconquerable superiority, which can enable them to accomplish with ease and indifference what other nations of the earth have found it necessary to concentrate years of laborious effort and painstaking scientific research to bring about.

The beauty and fragrance of a flower, or the flavour or nutritive qualities of a fruit, are the result of the adjustment of the metabolism which has taken place as much underground and out of sight, as in the leaves and branches which we can see and handle, and it is scarcely necessary to point out that this marvellous subtilty of adjustment, is controlled alike by the inherent vital forces of the ancestry, whether

vegetable or animal, and by those of the environment of which at the moment our coarser senses are more easily appreciative.

Dr. McCleary, Medical Officer of Health, Battersea, says :

" Strictly speaking, practically every infantile death is the result of both ante-natal and post-natal factors, but their relative importance varies in the different causes of death. Probably ante-natal conditions account for many of the deaths certified as due to atrophy, debility, marasmus, inanition and convulsions : and if due importance is attached to the soil as well as to the seed in considering the fatality of the infectious diseases, we must admit that even in such diseases as measles, whooping-cough and diarrhœa, ante-natal conditions affecting the nutrition and resisting power of the patient have some influence on the result of the illness. But the causes of death which most definitely depend upon ante-natal influences are premature birth, congenital defects and atelectasis and cyanosia."

Lecky in his *Map of Life* says :

" If one of the most responsible things a man can do is to bring a human being into the world, one of his first and most obvious duties is to do what he can to secure that it shall come into the world with a sound body and a sane mind. This is the best inheritance that parents

can leave their children and it is in a large degree within their reach. . . . In marriage the prospects of the unborn should never be forgotten."

" No more probable explanation has yet been given of the manner in which human nature has been built up, and of the various instincts and tastes with which we are born, than the doctrine that habits and modes of thought and feeling indulged in and produced by circumstances in former generations have gradually become innate in the race and exhibit themselves spontaneously, instinctively and quite independently of the circumstances that originally produced them."

Now in all biological creatures the stock-in-trade of potential energy is limited, and if an undue amount of it is diverted in any one particular direction it can only be by depriving others of their fair proportion.

Nature is a most exact accountant, and if we are extravagant of our capital she will demand from us not only the payment in full of the principal, but of a heavy rate of interest, before she will condescend to restore our credit.

The development of the embryo is one continual series of elaboration of simple structures into those of a more complicated nature. The processes of this development are sometimes spoken of as " differentiation," and it may

facilitate our grasp of the situation if we can lay down a working definition of our idea of the mechanism which controls this differentiation. It should not be necessary to point out that all biological operations are expressions of potential energy, and that the difference between truly constructive physiological processes and those of a pathological nature is simply a question of supply and adjustment of potential energy. If, then, we accept as a principle that all elaborate differentiation of tissue must be brought about by a fine adjustment of potential energy, we will, I think, find it a useful basis to work from ; but that we may understand the position more clearly, we must try to get some definite idea of the expression " fine adjustment." If a hundredweight had to be lifted from the floor and put on a vacant space on the table, where there is just about room for it, a weak man might summon all his power, grasp the weight, lift it with a spasmodic effort, and get it on the table, but he would most likely bring it down with violence, perhaps knocking over the lamp and maybe breaking the legs or some other part of the table. It will be seen that he had the potential energy to get the weight on the table " somehow," but not to adjust it exactly where it was wanted. On the other hand, a strong man would grasp the hundredweight, lift it quietly and easily, and place it exactly on the part of the table

he desired so gently as not to disturb or injure any part of the table or anything on it.

We see, therefore, that for " fine adjustment " there must be an amplitude of energy. I will not say an excess, for excess of any kind is incompatible with that balance which is the perfection of health, and in all sound physiological conditions the nervous system is just as alert to inhibit, as to activate, where any exuberance would be injurious. Even in common mechanics excess is guarded against, and a well-constructed and well-handled locomotive, while it has ample power to take a heavy train up an incline, has no excess, for as soon as the pressure rises it will blow off at the safety valve, and a skilful stoker will so regulate his fire and supply of water, as to keep his engine quite equal to its work with the valve just lifting. Now it is evident that if there is no potential energy there cannot be anything to adjust, and if the energy is deficient there may be spasmodic attempts, but fine adjustment cannot be attained and maintained.

If, therefore, the potentiality of the parents, which should be devoted to the adjustment necessary for the elaborate differentiation of the tissues of the developing embryo, is diverted either by disease, by excessive fatigue, by violent excitement, by depressing emotions, as in witnessing tragedy on the stage often produced with simply diabolic realism, or by the

abuse of stimulants, it is quite impossible for that steady control of energy to be maintained which is absolutely necessary for the progressive differentiation, that is so essential in all and every part of the embryo, to provide for all the details of the complicated machine competent to encounter the strain and difficulties of the life-history of an average human being.

This question of potential adjustment pervades the inanimate as well as the animated world; we find it controlling the vibration of light and colour, sound and motion, and constituting in us and around us the fundamental difference between noise and music, beauty and ugliness, pleasure and pain, and its consequences can be traced as the fundamental principle underlying health and disease.

In the early accounts of the creation we are told at various stages that "God saw that it was good," and further on that "God made man in His own image and breathed into his nostrils the breath of life and man became a living soul." But at a later period St. Paul tells us that "the whole creation is groaning and travailing in pain together"; and surely in our own time, as we pass through the slums of our great cities, or step across the threshold of our hospitals, asylums or gaols, it is difficult indeed to trace the image of God in the squalor, debauchery and disease which meet our eye at every turn; or in the profanity or groans of agony

which fill our ears till we would fain stop them with our fingers and fly for ever from the scene.

But as in the shattered timbers of the old wreck on the seashore pierced by sharp rocks or silted up with sand, covered with barnacles and slime and overgrown with seaweed, there can still be traced evidence of the strength and beauty of the great ship, that once rode the ocean so proudly, and bore life and treasure to the ends of the earth; so in mankind we find, even in his most degraded depths, there lingers a physical, mental and moral spark, which may be fanned into a bright and living flame reflecting the image of his Creator, and bringing help and hope to many a desponding or dying fellow-creature.

Experience shows that the possibilities of human life cannot be measured, and that man can become both for himself and others a blessing or a curse. Pascal, who was not only a profound Physicist, but a great observer of his fellow-creatures, put the case in a nutshell when he said that man was "either the glory or the scandal of the creation."

It will now be our duty to briefly review some of the fundamental principles by which we may hope to fortify the coming child against the latter, and to attain as great a measure as possible of the former highly desirable consummation, which may be taken up more conveniently in the following chapters.

CHAPTER II

PRE-NATANT EXISTENCE (*continued*)

"The blood is the life."

DEUTERONOMY tells us "the blood is the life," and modern science has not been able to dispute this simple statement. We may, then, take it as conceded that the first essential for physical development is a sufficient quantity of healthy blood, and that the question how we are most likely to procure healthy blood must be dealt with at the outset. And here I feel that I must say very emphatically that these subjects are culpably neglected in the schools in these countries; if they are referred to at all, it is in such an abstract and perfunctory way as not to give the child a chance of really understanding what the teacher has been telling him, while in Scandinavia, not only is the instruction well organised, but is continually put in practice in the gymnasium, bathroom, dining-room, playground, and many of the classrooms, so that when the pupils approach the period of parentage their lives have become an automatic expression of the principles of their early instruction.

Briefly the factors now demanding attention may be summed up under the following headings:

Air and Exercise
Hope, Cheerfulness and Calm
Food
Rest
Cleanliness

Air and Exercise

Of all the external influences operating on the human body, I think we are justified in taking air as the most important. It has been proved more than once that life can be maintained without food for quite forty days, but even those who have practised diving and experiments of a kindred nature, tell us that it is with great difficulty life can be maintained for forty seconds without renewing the supply of air.

The average adult breathes about sixteen times in a minute, and assuming that the air is good in quality and free from impurities of either a passive or an active nature, should take in a tidal wave of 30 to 40 cubic inches at each breath even when at rest. According to Halliburton the total air which passes through the lungs of an adult at rest in twenty-four hours ranges from 400,000–680,000 cubic inches, and may be more than doubled by exercise.

In city life, however, impurities are a constant factor, and in order to reduce their noxious effects and maintain as sound an adjustment of metabolism as possible, in which oxygen plays so important a part, the individual must either increase his tidal air, or the frequency of his respirations. We need not pause to point out that any increase in the number of respirations per minute entails an increased consumption of energy, and that therefore every reasonable effort should be made to cultivate the habit of deep, quiet breathing, so as to maintain the relative number of respirations proportionate to the activities of the individual as nearly normal as possible.

Cool air contains more oxygen per cubic inch than warm air, and hence we find that Nature, in her effort to meet the exigencies of human life, increases the depth or frequency of the respiratory movements as the temperature rises. A cubic foot of dry air at 32° F. weighs 566·85 grains, which, neglecting the slight amount of carbon dioxide present, gives 436·5 grains of nitrogen and 130·35 grains of oxygen. At a temperature of 100° F. a cubic foot of dry air weighs 498 grains, and is made up of 383·5 grains of nitrogen and 114·5 grains of oxygen. If a man breathes 16·6 cubic feet (which is about an average) per hour, he will receive at 32° F. 2,164·2 grains of oxygen, while at a temperature of 100° F. he would receive only

1,901 grains of oxygen or about 12 per cent. less than at the lower temperature.

Closely allied to the question of air is that of exercise, as by it the air is taken up into the tissues, and it is manifest that if the impurities in the air are in an excess the less of it taken into the tissues the better, and hence dancing, billiard playing and other forms of exertion in heated rooms, often in the small hours of the morning, when the atmosphere is loaded with impurities, and where the oxygen has been reduced to its lowest ebb, cannot fail to be most deleterious even assuming for a moment that the individual was not already fatigued and the blood charged with the products of retrograde tissue metamorphosis.

Hope, Cheerfulness and Calm

Solomon has told us that "a merry heart doeth good like a medicine," and every day we see the force and wisdom of this statement. The influences of a hopeful, cheerful spirit, not only upon the individual, but upon his surroundings and his offspring, cannot be exaggerated; at the very outset, therefore, we would suggest that the effort at all times to encourage hopefulness, cheerfulness, and their natural resultant calm, should not only be kept prominently before our minds, but be made a cardinal point in the teaching in our churches and schools.

Although the embryo is only a mechanism and in no way a psychological creature, it is being built up under the control of the nervous system of the parents, and the importance of hopefulness, cheerfulness and calm cannot be too much insisted upon, as the contrary conditions cannot fail to disturb the steady adjustment of potential energy which we have been considering. It is scarcely possible to maintain cheerfulness unless we are hopeful, for man lives more in the future than in the present, and these most desirable qualities should lay the foundation for calm :

> " Calm in the hour of buoyant health,
> Calm in the hour of pain,
> Calm in my poverty or wealth,
> Calm in my loss or gain."

Can there be any more beautiful picture of psychological triumph or more hopeful prospect of physiological economy ?

Calm is not indifference or callousness, both of which are merely the outcome of selfishness or stupidity. True calm can only be the expression of that confidence in the ultimate triumph of good, which is the well-spring of hope and cheerfulness. In a recent work, entitled *The Spirit, God and His Relation to Man*, by Canon Streeter, the following amongst other interesting passages occurs :

" The religious writings of men of old constantly emphasised confidence and cheerfulness

as the keynote to strength. 'In quietness and confidence shall be your strength.' 'Let not your heart be troubled.' 'Be not anxious.' 'Be of good cheer, I have overcome the world.' 'Say unto them of a fearful heart, "Be strong, fear not."' Such words as the following are literally fulfilled before our eyes in a shell-shock hospital of the present day. 'The eyes of the blind shall be opened, and the ears of the deaf unstopped.' 'Then shall the lame man leap as an hart and the tongue of the dumb shall sing.' 'They shall obtain gladness and joy, and sorrow and sighing shall flee away.' Accurately and wonderfully these words describe both the treatment by the suggestion of confidence and its effects, as well on the body as on the mind."

According to Munsterburg,

"neurasthenia is characterised by feelings of exhaustion and inefficiency, often only memories, and by insomnia; psychasthenia by irritable fears, emotions and impulses; hysteria by emotional instability, auto-suggestibility and inhibition, all arising from hereditary disability."

Personally, after giving many years to research on these subjects, we feel convinced that the psychological attitude here suggested, hope, cheerfulness and calm in the parentage, has a more favourable influence on embryonic development than all the other forces except pure air put together.

We have seen the offspring of poorly fed,

badly housed, overworked parentage, who were blessed with a hopeful and cheerful spirit, grow up healthy, happy and useful, while those of wealthy, but continually fault-finding, grumbling and despondent parents with all the advantages money can procure, missed the joys of childhood, were fretful, feeble and ailing, dying young or prolonging an existence which was a curse to themselves and all with whom they came in contact.

Rest : Early Hours

Next in order, perhaps, after hope, cheerfulness and calm, we would suggest the importance of early hours. The tidal wave of energy runs down rapidly from about 6 p.m. to about 5 a.m., and Dame Nature calls urgently for rest and suspension of external stimuli, that she may devote her little stock-in-trade at this time to clean up and repair the machinery for the following day ; and it is not too much to say that every hour of either mental or physical exertion prolonged after about 8 or 9 p.m. is hindering the next day's work ; there was sound philosophy in the man who exclaimed, " I have so much to do that I am going to bed." Dr. Schiøtz, Head of the Medical Department in Kristiania (now Oslo), says that late going to bed is the most frequent cause of malnutrition amongst the children under his observation.

Periodicity in the more active manifestations

of force appears to pervade the whole universe ; we have day and night, summer and winter, seed-time and harvest-time, storm and calm. It would seem, therefore, that rest, or, at least, very great modifications of the discharge of energy are as essential to the material as to the biological world. Our concern at present, however, is with man, and in him it can be demonstrated that there is a diurnal tide of energy which is highest about 6 p.m., and lowest about 5 a.m. Plate No. 1 is a diagrammatic representation of the work of Dr. Marsh. He found that this daily tide of potential energy averaged, in the majority of individuals, its lowest at 5 a.m., then rose steadily till about 11 a.m., fell very decidedly from that, till 1 or 1.30 p.m., when again it began to rise, and attained its maximum for the twenty-four hours about 5.30 p.m.

This tidal wave was found to rise more rapidly and fall more markedly in women and children, and was slower and more equable in men. This drop in potential pressure seems instinctively recognised all the world over, for whether it is called tiffin, déjeuner, or lunch, people in all countries pause for a meal and a rest somewhere between 11–2. Dr. Schiøtz has demonstrated that in the development of childhood there are distinct periods of increase and decrease of growth-momentum which follow just as definite a law as that of the diurnal tidal

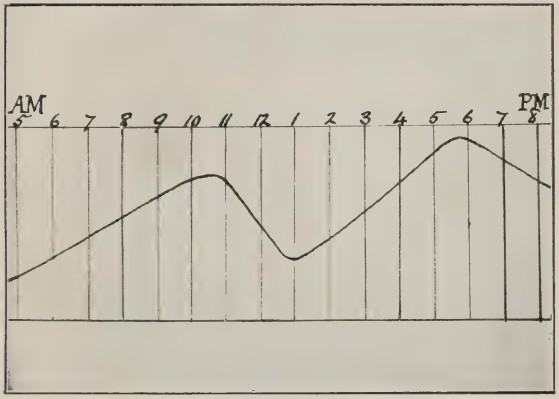

PLATE I.—DIAGRAMMATIC REPRESENTATION OF THE WORK OF DR. MARSH.

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wave. This subject will be again referred to when dealing with the heart.

It is not necessary here to discuss the theories put forward to account for this tide, but for all practical purposes there is sufficient evidence to show that it pervades all parts of the earth and all races of mankind.

What are called the civilised races, however, rather resent having to submit to the inconvenience of being required to regulate their activities by the laws of the universe, which they appear to think should be their slave rather than their master, and prefer to arrange their periods of rest and refreshment more in accordance with what they call their own convenience than the requirements of their physiological constitution ; and often regarding their work in life as something to be got rid of as hastily as possible, make the effort to rush through a day's work straight on end, giving themselves but a few scanty moments hurriedly to snatch a lunch, which is gobbled down in such a manner as practically to preclude the possibility of its being digested ; and think they can atone for all delinquencies in this respect by sitting over a heavy dinner in the evening which their nervous system is too exhausted to assimilate, and at which the appetite has to be tempted by a variety of condiments and stimulants, and finally get to bed in the small hours of the morning and rise

to face another day, weary and headachy, after a restless night of broken sleep and discomfort.

If we " muddle through " our digestion and " muddle through " our rest, we will certainly continue to " muddle through " our work ; but if we would recognise that as active units in a great cosmos we must fall into line with the physiological laws which govern that cosmos, then it would be our ally and strength ; effort would be a pleasure and life worth living ; the adjustment of potential energy towards the great end in view would be automatic, and the resultant harmony with the great creation of which we claim to be the crowning point.

If the whole community could be trained to make its work coincide with the rising, and rest with the ebbing tide of energy, the result would be more effective work, more refreshing rest, and great economy of potentiality.

Instead of endeavouring to cram the day's work into one continuous effort somewhere between 9 a.m. and 6 p.m., the day should be divided with an interval about 11 to 1, when a quiet meal could be taken with every reasonable prospect of its being thoroughly assimilated, followed by a period of rest, sufficient to give Dame Nature time to equip herself to resume the battle.

At this point we will only make a passing reference to the wonderful results obtained by

Taylor of Bethlem, U.S.A., when he found that by better arranged periods of rest, 35 girls working $8\frac{1}{2}$ hours a day, did as much work, and did it better, than 120 working $10\frac{1}{2}$ hours a day, and his further experience with men loading pig-iron, shovelling, etc. The scientific explanation of these extraordinary results can be seen quite clearly when we consider the development and structure of the neuron.

Assuming, then, that we have done all we can to obtain fresh air, to maintain a hopeful and cheerful spirit, to regulate our rest and exercise on sound physiological principles, there are still the accessories of food and cleanliness to which we must direct a few moments' attention.

CHAPTER III

PRE-NATANT EXISTENCE (*continued*)

"May good digestion wait upon appetite and health upon both."

Food

To many it will seem that food should have occupied the first place in our considerations, but we have already shown that while it is possible to live weeks without food, we cannot exist without air for even a comparatively small number of seconds; and again, we may point out that millionaires surrounded by every variety of food are often feeble and ailing, while the poor peasant with but limited quantity and practically no variety of food, is usually vigorous and long-lived. It is, therefore, evident that food in itself is not of so great importance as the way it is taken, and the condition of the digestive organs at the time it is taken.

The nerve-centres may be compared to the Government; and if the Government is bankrupt the trade and prosperity of the country are more or less paralysed. If the nerve-centres are exhausted by overwork, prolonged anxiety, self-indulgence, depressing emotions, such as

fear, hatred, etc., or abuse of alcohol, the adjustment of potential energy necessary to elaborate the digestive secretions falls short of the mark and the food, no matter how good in itself, when introduced into the stomach will undergo decomposition rather than digestion and act more as an irritant than as a nutrient. In this matter the lower animals often display more wisdom than man, for if a horse is brought in very tired he will refuse to eat, while a man, though exhausted by fatigue and anxiety, will sit down to a heavy meal as though under the impression that his stomach was an independent organism, capable of meeting the most urgent demands, while he does not supply it with the nerve-energy to do so.

Mastication

The question of mastication is every day of greater importance, for civilised races are becoming more feeble in the jaws and deficient in teeth, and it is manifest that if the masticatory apparatus be defective, and we would accomplish the process, with even partial efficiency, we must give more time and energy to it. It is not sufficient that the food be merely broken up into small particles, but we require pressure after the teeth come in contact, that the continued contraction of the masticatory muscles on the salivary glands may discharge the more

active saliva to be intimately mixed with the food. Quite too frequently the food is passed into the stomach almost entirely without being insalivated, and hence can only operate, to a great extent, as a foreign body, producing flatulent distension, and weakening both the glands and the walls of the stomach and intestines.

We will see, therefore, that under favourable conditions, such as we have suggested, cheerfulness, exercise in the open air, reasonable rest, giving sufficient time to meals which should be regulated with due reference to the diurnal tide of energy, there is not a great deal to be said, just here, about food; as those who are likely to be in the responsible position of parentage should have some knowledge on this, which we may call an "every-day" part of the subject. We would, however, like to utter a warning about Patent and Tinned Foods: some of them are undoubtedly most useful under circumstances of special difficulty, but certainly should not be taken habitually. Many of the patent foods are, to some extent, pre-digested, which robs the digestive organs of part of their normal work, and sooner or later will debilitate them; further, most of these foods claim to give all the nourishment required in very small bulk, but a certain amount of bulk is necessary to rouse the peristalsis of the stomach and intestines, which

in its turn stimulates the circulatory, nervous and glandular systems, to take their share in the work so that all may contribute their reasonable proportion to the common weal. Tinned foods are often used *to save time*, many of them are cooked before they are tinned, and can be eaten immediately after they are turned out, but, unfortunately, we have no means of knowing what condition the food was in before it was cooked, nor how long it has been in the tin, and many chemical changes have been taking place in the food itself or between it and the container, and in this as in many other positions in life we may save an hour and lose a month or more.

Simplicity and moderation are two good rules, which here as elsewhere will often help us when we are in doubt.

In a certain number of pregnancies there is a good deal of sickness and nausea, and in these cases some of the patent foods may be useful, but if the sickness continues for any length of time, the mother should give herself the habit of chewing some hard substance to encourage the development of the embryonic teeth, crust or hard biscuits, or liquorice root, or sugar cane, or even a piece of ivory or bone, anything that is hard and clean; other things being equal, the more she chews the easier the child will get its teeth.

White bread contains very little nitrogen

and phosphates, and is too soft, so wholemeal, oaten cake or rye bread are to be preferred; fresh fruit and vegetables are good, especially green vegetables, cabbage, sprouts, peas and beans, but pears and rhubarb had better be avoided unless we know that the kidneys are quite sound; eggs, fish and butter are good, but margarine has been shown to be deficient in vitamines, so cannot be recommended.

The teeth and bones of the embryo and growing child require a plentiful supply of lime salts, which may be derived from a liberal use of milk, cheese, oatenmeal, wheatmeal and vegetables. The moderate use of meat should have its place in a general diet, but re-cooked or chilled meats are not desirable, and the less tea, coffee, condiments and stimulants the better. A sufficient amount of fluid should be taken in the 24 hours, but very little at meals. A good drink of water on rising in the morning, fairly hot, and again about an hour before dinner.

Alcohol

The claim to class alcohol as a food has broken down. We will, therefore, review its position under a separate heading, but as the literature on the subject would fill several volumes, we must confine ourselves to putting forward only a few of what we believe to be the most forcible points of evidence.

Its effects have been found so serious and far-reaching that many observers and experimenters have made special investigations on plants, animals and men; and if we are to examine the results in this order I fear I must first trouble you with some of my own experiments.

Some years ago when lecturing on this subject to the schools, I wished to have something concrete to show the children, knowing that what we have seen and handled we remember much better than that which we have only heard. I took six plants, two veronicas, two geraniums and two tobacco plants which had been grown in the same greenhouse under the same conditions, and were the same age. I put them on a large tray in my bedroom in a good light, near a sunny window which was always open, and every morning watered one of each specimen with a certain measure of water and the other with the same quantity of water plus a teaspoonful of ordinary whisky. At the end of the first week the whisky plants gave me the impression of being a better colour and rather more vigorous; at the end of the second week they still seemed to be gaining, but the difference was so slight that I could not be positive about it, so I increased the whisky to two teaspoonfuls; at the end of the third week there could not be any doubt that the whisky plants were a deeper green and better

grown, and appeared rather taller. I intended taking some exact measurements, but my time just then was very much occupied, so I postponed, hoping for a more convenient season. In the meantime there came a slight frost, and the whisky plants were drooping in a few hours, and quite dead in a couple of days ; the water drinkers were not affected in the least and were healthy for many months in spite of draughts and changes of temperature in making a tour of several schools in different localities.

It would seem, therefore, that alcohol has the power to call out energy, but not to supply it, and the overdraught on the metabolism can only result in bankruptcy. We have all seen big powerful-looking people with high colour and loud voices, whose confident manner is often mistaken for courage, and yet who have gone down only too easily under circumstances that perhaps the feeble-looking and pale-faced neighbour would scarcely take notice of.

Dr. Chalmers, in his recent Medical Report on the health of Glasgow, has discussed the significance of the ante-natal factors in the problem of infantile mortality, and Dr. Leslie Mackenzie, in his work on the Medical Inspection of school-children, has also called attention to the practical importance of the question.

" The whole question of infantile mortality, indeed, stands much in need of a more searching

analysis. It is probable that fuller knowledge would emphasise the importance of the ante-natal factors." Prochownick has brought forward evidence to show that the development of the fœtus is definitely affected by the diet and mode of life of the mother during pregnancy. According to Ballantyne, " Prochownick and his followers believe that by altering the diet in pregnancy it is possible to influence the character of the confinement, of the puerperium, and of lactation, as well as the state of the fœtus. Thus, by dieting anæmic, chlorotic, or fat or weak women, it has been found possible to give them back the power (which they had lost) of nursing their infants." Further evidence is afforded by Dr. Noel Paton's experiments on guinea-pigs. Dr. Paton found that whereas the average weight of the young of well-fed pregnant guinea-pigs was 0·35 gram per gram of the mother, the young of guinea-pigs kept on a low diet during pregnancy weighed only 0·24 gram per gram of the mother, and he holds that these experiments " warrant the conclusion that the size of the offspring depends very directly on the diet and nutrition of the mother during pregnancy." He thinks the high infantile mortality amongst the poor is to some extent explained by the fact that owing to defective ante-natal nutrition the " infant starts life at a low level, and readily succumbs to the hardships to which it is too

often subjected." The influence of alcoholism on infantile mortality has an important antenatal aspect. By experiments on animals and observations on the human subject, Niclouz has demonstrated that alcohol passes freely from the maternal to the fœtal circulation, and he points out the importance of the toxicity of alcohol on an organism whose nervous system is in process of formation. It is evident that the province of preventive medicine must be extended so as to include intra-uterine puericulture. We must get rid of the expression "non-preventable" in relation to infantile mortality.

In an address delivered by Dr. MacNicholl, he made the following statement:

"Through a long line of successive generations I have made a study of two separate groups of families—one group of children of drinking parents, one group of children of abstaining parents. In ten families of drinking habits there were fifty-five children. Thirty died in infancy, three of heart disease, four were insane, seven were anæmic, eight were tuberculous, one had diabetes, three had very poor teeth, three had adenoids. Only four of the number were normal. Of the total, two were excellent, six were fair, and seven were deficient in their studies.

"In ten families of abstaining parents there were seventy children. Two died in infancy, two were neurotic and anæmic, one had rheu-

matism, one was tuberculous, and sixty-four were normal. In study, fifty-six were excellent, ten were fair, only two were deficient.

" Of the children of total abstaining families, 90 per cent. were normal ; of the total of children of drinking parents, 93 per cent. were abnormal.

" Eighty per cent. of the children of regular drinkers have convulsions while teething. Of children dying from such diseases as measles, whooping cough, scarlet fever, and other infantile disorders, a large percentage are children of drinking ancestry."

The Physical Degeneration Committee for 1904 reported as follows :

" As the result of the evidence laid before them, the Committee are convinced that the abuse of alcoholic stimulants is a most potent and deadly agent of physical deterioration."

W. McAdam Eccles, M.S.F.C.S., says, in dealing with alcohol and hereditary alcoholism :

1. " The offspring of alcoholic parents are apt to be ' feeble-minded ' or to inherit an ' unstable ' nervous system, and are, therefore, more liable to form a drug-habit than others.

2. " Hence such progeny are likely to become alcoholic if they commence the taking of alcohol, and, consequently, total abstinence may be their only safeguard.

3. " Weaklings from their birth up, deficient in vigour of body and mind . . . we find, indeed, that the psycho-neurotics were of the same

stuff as drunkards are made, since in 50 per cent. of them there had been alcoholic excess among their parents and grand-parents."

Morel places alcohol first on the list of all causes tending to produce organic impoverishment in posterity.

Writing in the *Franco-British Medical Review*, Dr. J. Comby says:

"Hereditary, neuro-arthritic, cerebral excitement may, if neglected, be aggravated and transformed. The excitable subjects of the earlier years will become the hysterical, epileptic and mad subjects of adolescence and mature age.

"Heredity, then, plays a great part in the ætiology of infantile cerebral excitement. This heredity may be purely neuropathic, extreme impressionability of the parents, hystero-epilepsy, neurasthenia, mental instability, psychic deficiency. Elsewhere it is an arthritic heredity that is found in the hereditary antecedents of obesity, gout and diabetes. In some cases it is the alcoholism of the progenitors that is the causative factor. Alcoholic parents are observed to produce children predisposed to convulsions, tics, various spasmodic affections, and cerebral excitement. The circumstances of gestation are to be considered; the troubles and lively emotions of the pregnant woman."

Dr. Paget Lapage, writing on permanent mental deficiency in childhood, says, "The health of the mother during pregnancy is an important point."

Tobacco

It is to be regretted that women have for some years back taken so much to tobacco, the effects of which can only be injurious, and cannot serve any useful purpose; even in the male the less of it the better, but most men cannot smoke while at their work, but if women take it up there is, too often, nothing to prevent them smoking all day long, and unfortunately they show a tendency to greater excesses than men, and some of them even boast of their folly in this respect, and vie with each other in running to extremes.

The modern young woman who smokes cigarettes and keeps late hours is seriously impairing the buoyant tendency of the vital and health statistics of the American.

Dr. Lyman Fisk, director of the Life Extension Institute, in an address at an educational conference quoted figures to show that the steady increase in the average lifetime has been retarded in recent years by "the female of the species in age between 17 and 32."

He pointed out that the young women of to-day do not show such good health records as their brothers, and added:

"The over-confident, self-sufficient young female who thinks she can set up her own ideals and standards and disregard the fundamental

ethics of living, should be warned how high is the price that is being exacted from her for her freedom. The proof of the pudding is in the eating, and, according to mortality statistics, this freedom pudding doesn't digest well."

Recent researches go to show that nicotine raises the threshold resistance at the synapses of the nervous system, slowing down reaction and sometimes even obstructing the passage of impulses altogether.

In conclusion it is necessary to utter a word of warning against too frequent conceptions. Dr. Marion Mackenzie says, " For many years I have taken the family history of every baby registered at my infant clinics, and find the more unhealthy the stock the more quickly it is propagated. Healthy families are usually well spaced" (New York correspondent, *Daily Mail*, November 21, 1924.) My own experience fully supports her in this matter.

Cleanliness

The human skin is divided into several layers, but for all practical purposes it will be sufficient to look upon it as composed simply of the epidermis or outer layer, and the cutis vera or true skin. The true skin is a highly vascular structure richly supplied with blood-vessels and nerve terminals, while the epidermis is non-vascular, composed of a number of strata of

cells, the deeper of which, being more or less granular, sometimes called the stratum granulosum, become more and more scaly as they approach the surface.

The functions of the skin are protective, eliminatory, thermic and absorptive. We need not do more than mention the first, but the remainder of the group, it will be seen, are accessory to the lungs, the liver and the kidneys; and although when all these are fully discharging their functions, not so much is demanded of the skin, yet when any one or all of them are over-taxed or interfered with, the skin is called upon to make compensatory efforts to maintain the equilibrium between waste and repair, which are essential to even a moderate amount of vital energy. It is therefore highly important that the skin be maintained in as healthy a condition as possible by baths, friction and ventilation, which are all necessary not only for the removal of the dried and worn-out epithelial scales, but also for the excretions, which are discharged from the sweat glands and pores, and for the stimulation of the flow of blood through the network of small blood-vessels which ramify freely through the deeper layers of the skin.

Baths may be hot, tepid or cold; hot and tepid baths are the more cleansing, from their greater capacity to soften the superficial scaly epithelium, but are more relaxing. If, however,

they are followed by brisk friction or a cold douche the relaxing effect is mitigated.

The *modus operandi* of the cold bath may be explained in a few words. The application of cold to the surface causes the partial closing or constriction of the small blood-vessels; this raises the arterial tension and stimulates the heart, which, if sufficiently rested and healthy, overcomes the increased pressure, and the cold being now removed, is followed by a reactionary wave of blood through the small blood-vessels of the surface, and so by frequent repetition the system is trained to overcome contact with cold. But if exposure to cold be prolonged and the contraction of the superficial arterioles more or less permanent, the heart tires and often dilates, the blood collects in the veins, resulting in that blue colouration of the surface known as cyanosis; the foundation is then being laid for all manner of abnormal processes, and recent researches point to this chronic hindering of the circulatory powers in early life as being a largely contributory factor in the subsequent development of epilepsy and insanity.

In late years the beneficial effects of the sun's rays are being more fully appreciated; the results of experiments in cases of rickets go to show that the sun's rays are one of the most important and active agents in preventing or curing this most distressing and troublesome condition. It has been found that even passing

through the purest of glass the most important rays are either arrested or deprived of much of their active power over metabolism.

For these and other causes what are known as sun baths, that is, the exposure of the surface of the body to the action of the full sunlight for more or less prolonged periods, without the interposition of any covering, has been found useful, both from a prophylactic and curative point of view.

The *Central News* says under the heading, " Sunlight to Order " :

" Artificial sunlight, powerful in ultra-violet or health-giving rays rather than in light or heat intensity, obtained by use of a fused quartz mercury vapour arc lamp, has been used with startling results on young chickens at the University of Maine. (*New York Herald's* correspondent.)

" The test proves that rickets in children are caused largely by the absence of direct sunlight, and the rays are expected to do much in combating this disease.

" The findings are also to show results in an educational way by teaching the value of outdoor life, particularly in rearing children. They may also reveal factors influencing the growth of children.

" Experiments conducted by Dr. C. C. Little, President of the University, and Dr. W. T. Bovie, Professor of Biophysics at the Harvard Medical School, in co-operation with the General Electric

Company, on the brood of pedigree chicks, reveal that not only larger and stronger chicks can be raised under the artificial sunlight, but that chicks raised under natural sunlight filtered through ordinary window glass developed weak legs and rickets, and weighed but one-fifth as much as the others, and often died unless a change in living conditions was made.

"Babies of poor families brought up in dark alleys or crowded tenements, and rich children brought up in homes where windows are closed and all sunlight is filtered through glass, develop rickets, and, according to Dr. Bovie, this is one of the chief causes of bow legs, which most mothers believe result from allowing the child to stand on its feet or walk too early in life."

PLATE 2.—REPRESENTS THE OFFSPRING OF DISEASED PARENTAGE.

This poor miserable little child died a few hours after admission to hospital, and surely one can only feel thankful that it did die, for the prolonged existence of such a creature could scarcely be otherwise than a prolonged calamity.

The sins of the fathers are visited upon the children unto the third and fourth generation.

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CHAPTER IV

THE HEALTH OF THE CHILD

"Train up a child in the way he should go: and when he is old he will not depart from it."

In our last we took a brief synopsis of what we believe to be the most active factors in determining heredity. We are now in a position to continue a similar line of investigation as to how we may be enabled to follow the physiological lead in the development of the infant and child, for it is only in this direction that we can possibly hope to attain anything deserving the name of Education.

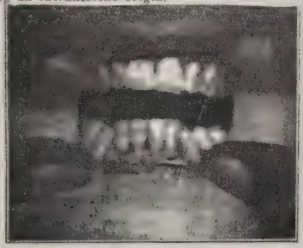
The wonderful progress made in Scandinavia and by Dr. Montessori in Italy has been brought about simply by accepting the child as a purely physiological unit and recognising the serious nature of the mistake, too often made in these countries, of treating him as a psychological creature before he is physiologically developed. Dr. Montessori, Wundt, and indeed all unprejudiced thoughtful observers are quite clear that the psychology of the young child is so rudimentary that attempts to appeal to it can only be disturbing to the physiological processes

which are devoting all their energies to that proportional development in the growth of the organism upon which such severe demands must be made in later years, if an active and independent life of practical utility is to be brought to anything like even a moderately successful and happy issue. From the days of Socrates and Plato, and probably before them, there has always been a voice crying in the wilderness for closer observation of the child and better adaptation of circumstances to capacity; but ignorance, which is always conceited and overbearing, has too often carried the day, and childhood has been exploited to make money for, or to advertise, people whose boastfulness and self-assertion has been mistaken for learning and ability. The unsuspecting public are tempted by the glittering bauble of school prizes, and show-off performances, to sacrifice the future for an hysterical present in the limelight of a few years of excitable vainglorious ostentation.

Now to trace the life history of the child it would seem natural to begin with the infant at the breast, but as embryonic development has been our theme in dealing with pre-natant existence, we propose to continue this part of the subject while it is still fresh in our memory.

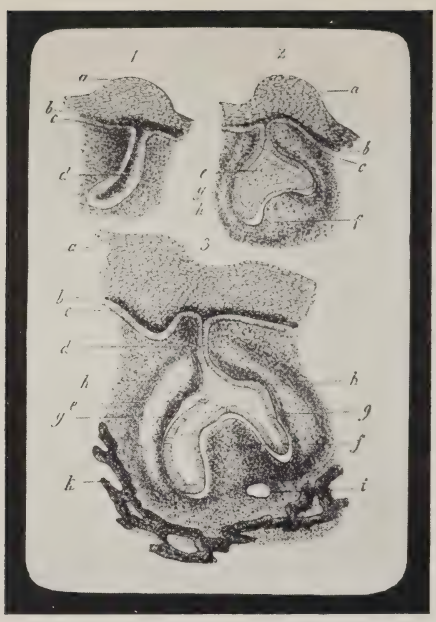
The teeth are perhaps most easily understood, and have been carefully traced by many observers in the embryo and in the child; we

Hypoplastic temporary teeth. The incisors are defective in the entire crowns, showing an intrauterine origin.



Shows a horizontal band on the lower teeth, due to whooping-cough. Aged 3. The uppers show a similar band of enamel, defective only in quality (dull white).

PLATE 3.



THREE STAGES IN THE DEVELOPMENT OF A MAMMALIAN TOOTH GERM.

a, Oral epithelium heaped up over germ.

b, Younger epithelial cells.

c, Deep layer of cells or rete Malpighi.

d, Inflection of epithelium for enamel germ.

e, Stellate reticulum.

f, Dentine germ.

g, Inner portion of future tooth sac.

h, Outer portion of sac.

i, Vessel cut across.

k. Bone of jaw.

PLATE 4.

PLATE 5.

a, Oral epithelium. *b*, Bone of jaw. *c*, Neck of enamel organ. *d*, Dentine papilla. *e*, Enamel cells. *f*, Stellate reticulum. *h*, Germ of permanent tooth, the enamel organ of which is derived from the neck of its predecessor.

will, therefore, endeavour to make our position more clear by taking them as typical of the processes of embryonic differentiation, and we can see by reference to Plate 3 some of the unfortunate results of disturbance of that delicate and complicated process.

The germ of the tooth is formed about the sixth week of intra-uterine life (Plates 4 and 5), and if the parentage up to that time has been sound, the epithelium from which the enamel is about to be developed, and the dentine from the dental papilla will be well provided for. If the mother is active and healthy, chews hard food, is cheerful and avoids fatigue, the progress of the tooth should go on favourably, and the dental sac, which is destined to provide for the permanent tooth, have every prospect of being well furnished. But on the other hand, should the mother be exhausted, either from over-stimulation or overwork, and endeavouring to maintain a precarious existence on food deficient in the essential elements, which is soft and makes no demand upon the processes of mastication, the tooth germ will be imperfect and feeble (resulting as seen in Plate 3, upper part), and the rudimentary jaws so small as to provide but scanty accommodation for their future occupants. In Plate 6, we have a highly magnified section of the fully developed enamel with an accumulation of micro-organisms attached to its surface. In

Plate 7, we gain, perhaps, a clearer view of the beautiful structure of fully developed enamel tissue, showing very clearly the enamel rods and the transverse markings on those rods. It will be also seen that the micro-organisms attached to the surface have developed vigorously, generating an acid, in a manner similar to the common vinegar plant, which is already producing decay in the portion of enamel with which it is in contact, and it will be observed that the normal distinctive characteristics, so well seen in the more remote parts of the enamel, are quite lost in that portion which is immediately in contact with the acid-producing micro-organisms.

In Plate 8, the two upper figures represent the jaws and teeth in a normal child of about four years of age; it will be seen that the alveolar arch in the upper jaw, between the posterior internal corners of the second deciduous molars, measures nearly a fourth more than the depth of the arch taken from the point at which this base line intersects the median suture; in other words, the normal superior maxillary arch in the child should be broader by nearly one-quarter than it is deep, from before backwards. The lower portion of Plate 8 gives an anterior view of complete sets of deciduous teeth with portion of the alveolar processes cut away, showing the permanent teeth in the substance of the bone.

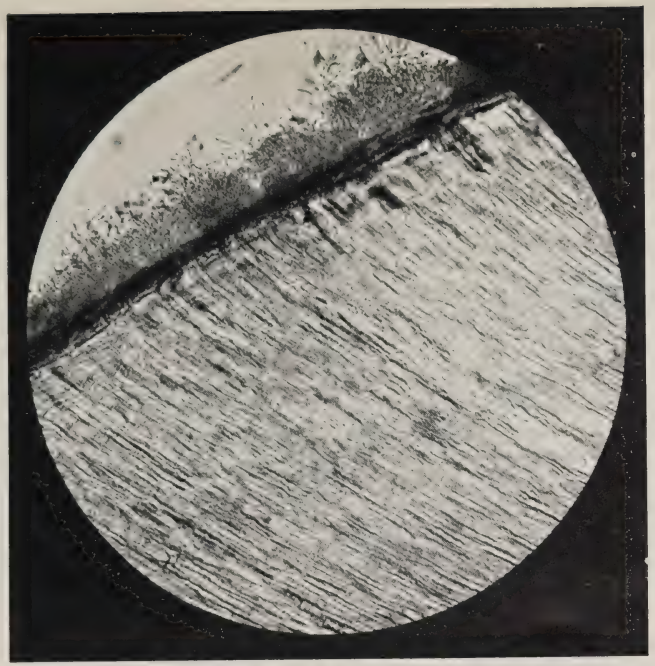


PLATE 6.—ENAMEL WITH MICRO-ORGANISMS ON SURFACE.

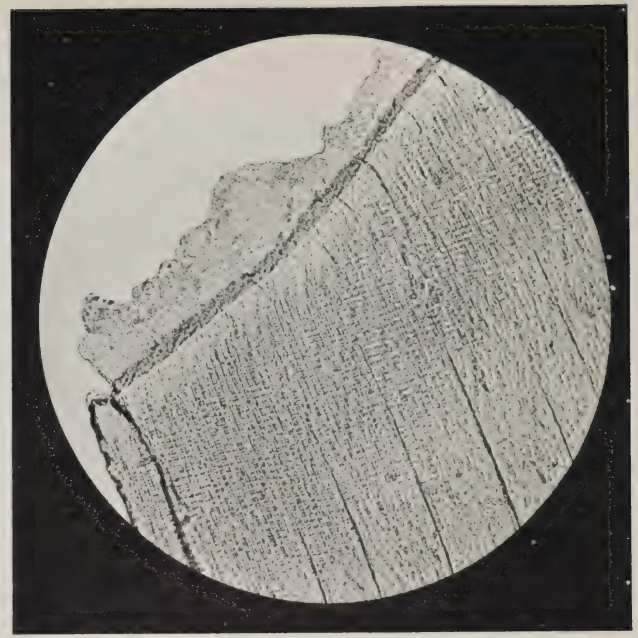


PLATE 7. ENAMEL SHOWING INCIPIENT DECAY DUE TO ACID GENERATED BY MICRO-ORGANISMS.

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There is a strong conservative effort in Nature to revert to the normal type whenever she should get a reasonable opportunity. Deformities mechanically produced after birth, such as crooked toes from badly made boots, cutting lamb's tails and dog's ears, do not act through the nerve-centres and are not transmitted. Those who have lived much amongst the Chinese tell us that though women's feet have been deformed for many generations by binding in childhood, yet the infants are born with normal feet. But conditions operating through the nervous system, especially if continued for any length of time, are frequently reproduced.

The normal development of the jaws and teeth is now, unfortunately, very seldom seen. For many generations the tendency in highly civilised races has been to eat soft foods, and to meet excessive fatigue by the use of various stimulants. The continued use of soft foods has deprived the jaws of their natural exercise, while the life of stimulation and fatigue has robbed Dame Nature of that energy which she would reserve for the constructive processes of metabolism. Finding herself impoverished, she adopts the expedient of giving her best energy to constructing the more vital organs, and only the little she can spare to those which are less necessary for mere existence, hence we find as generations succeed each other under the reign of our so-called civilisation, that the

teeth, hair, skin and nails are being constantly allotted a smaller share of her energy and attention. We are justified, however, in the belief that under favourable circumstances Nature would here also revert to the normal, and hence in our observations on pre-natant existence, we have urged the importance of returning as much as possible to a simple natural life.

Dr. J. L. Dick says in *School Hygiene*, November 1916 :

" All these changes which are appearing in the teeth and jaws of modern British people, arise, we suppose, from the soft nature of our modern diet. We believe that, were modern men to resume a Neolithic diet, their teeth and palates would again be moulded in the ancient manner."

In Plate 9, we see a sound set of fully developed teeth in the adult, showing a normal arch, and here the measurement is greater in depth from before backwards than from side to side. It will also be observed that the proportion of the jaw to the rest of the under-surface of the skull in the adult is much greater than that in the child (compare Plates 9 and 10), for in all measurements the brain capacity of the child must be larger in proportion to the rest of the body than in the adult, as the brain in early life has to preside over the

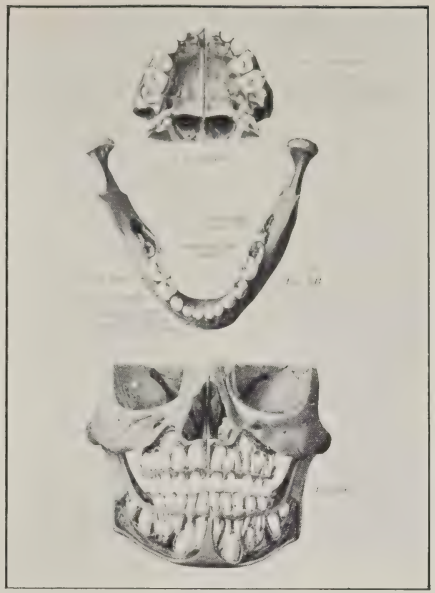

PLATE 8.—JAWS AND TEETH IN NORMAL CHILD ABOUT FOUR YEARS OF AGE (see p. 44).

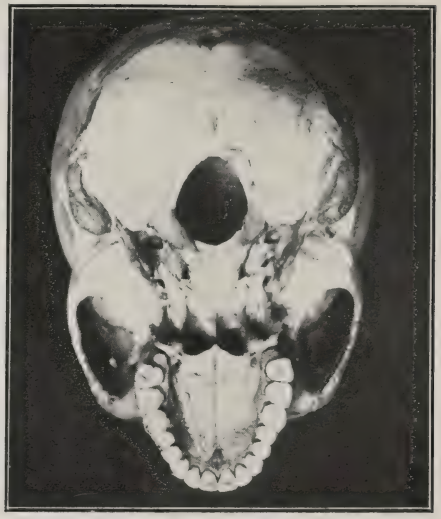

PLATE 9.—UNDER-SURFACE OF ADULT SKULL SHOWING PROPORTION OF BRAIN CASE TO UPPER JAW.

PLATE 10.—UNDER-SURFACE OF CHILD'S SKULL SHOWING PROPORTION OF BRAIN CASE TO UPPER JAW.

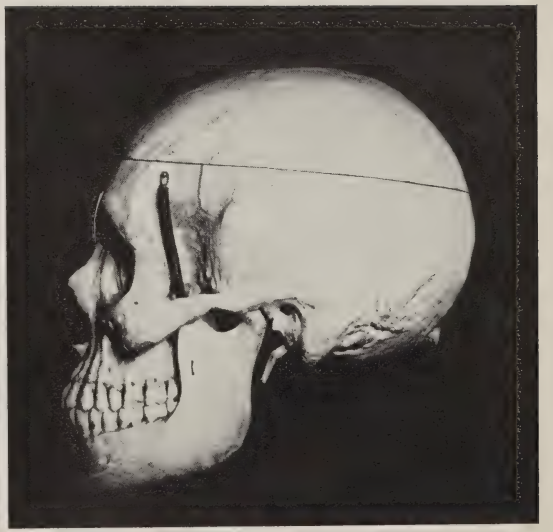

PLATE 11.—PROFILE SHOWING NORMAL TEETH IN ADULT.

formative processes of metabolism which become less active as years increase.

Plate II is taken from an adult jaw seen in profile, showing a normal set of teeth. It will be observed that the inferior incisors close immediately behind the superior incisors, that there is complete co-aptation of the cusps of the upper and lower teeth, and that the pressure is distributed as we pass forwards from one tooth below to two above ; the surfaces of the teeth should come into such perfect contact that the smallest body possible would be detected between them.

Mastication

In the process of mastication, it is not merely sufficient that the food should be finely divided, but the surfaces of the teeth should move laterally upon one another, so as to exercise a bruising and triturating effect, and the contraction of the muscles of the cheeks, etc., should be prolonged after the teeth have come in contact, so that the muscular fibres may press upon the ducts and glands, expressing the more digestive saliva into the cavity of the mouth, and that by the alternate contraction and relaxation of these muscles, and the varying pressure upon the teeth, the flow of blood through the arteries and veins may be greatly increased.

It will be seen, therefore, that to pass meat or other food through a mincer, and then encourage it to be swallowed hastily, is to defeat one of the principal functions of mastication.

The passage of the food into the stomach should take place in small mouthfuls, as thereby each mouthful, having been thoroughly insalivated, has an opportunity of becoming impregnated with the gastric juice before the arrival of the next. Whereas, if the food is hastily swallowed, in the first place it cannot be thoroughly insalivated, and in the second, the large mass which is formed in the stomach is only exposed to the action of the gastric juice on its outer surface, and although, in the case of a vigorous individual in whom the gastric peristalsis and secretion of gastric juice is energetic, this mistake may be rectified, yet it is done at an expense, and Nature will exact the uttermost farthing for every outlay that is demanded of her.

It is, therefore, our duty to endeavour to train children to eat slowly. Cheerful conversation during meals and obliging the children to stay a certain length of time at the table, are probably the best methods of accomplishing these ends. At a school in Kristiania we were present at a dinner class of "malnutrition children" where a watchful teacher was on the alert to make the children eat slowly, masticate

thoroughly and to regulate their conduct with some respect for the feelings of others, which costs nothing and yet means so much in after-life.

Cordelia O'Neill says in the *American Journal of Dentistry*:

"If they can be induced to end a meal with a coarse acid vegetable or fruit that will clean the surface of the teeth instead of the soft, sweet pastry or puddings, much difficulty will be forestalled. If they can be made to feel that they must either *lose* or *use* their teeth, there will be better mastication. . . . There will still be the fight to keep the teeth healthy. So long as soft foods, incorrect foods and, worst of all, adulterated foods are eaten, so long will continuous tooth decay obtain."

All solid foods should be dealt with first, and a small drink may be taken at the conclusion of the meal: it will tend to wash some of the adherent particles of the solid food out of the teeth, and as the gastric juice has had a good start in a fairly concentrated form, the process of peptonisation is already on the way, and a little fluid then introduced into the stomach may assist in softening the alimentary bolus, and allow it to pass through the pyloric opening more easily. The common habit of taking 'bit and sup' about cannot be condemned too strongly, as it not only facilitates the swallowing of imperfectly masticated food,

but also dilutes the saliva and enfeebles the action of the ptyaline.

It is, of course, necessary that a sufficient amount of fluid should be taken in the twenty-four hours to maintain the secretions and excretions which are continually being carried on, but this fluid should not be taken at meals. It is a good practice to drink a little warm or fairly hot water on rising in the morning, and again about an hour before the midday meal, which will probably be sufficient, as milk and soup are likely to enter largely into the dietary of childhood.

The tenderness which results from even one or two carious teeth will often prevent the child chewing crusts or stale bread, and the septic matter retained in the carious cavities will attack other teeth, sometimes those in process of eruption, as well as causing loss of appetite and gastric disturbance by being swallowed with the food and saliva.

" Vitally interesting, and on the whole hopeful, facts concerning school-children are published in the Annual Report for 1921 of the Chief Medical Officer of the Board of Education, London. Approximately 2,521,500 children in elementary schools were examined in England and Wales in 1921, and 40 per cent. of the children were found to be suffering from physical or mental defect of some degree.

" With regard to dental defects in 1920,

dental inspection of 583,000 children showed that 70 per cent. required treatment. In London, where dental service is in existence, in 1921, 40 per cent. of boys at the age of 12 were found defective, as compared with 50 per cent. in 1913, and in Cambridge, where steady constructive work has also been done, there has been a steady fall in the percentage found defective from 85 in 1908 to 49 in 1920."

The report for 1923 says :

"The condition of the teeth of entrant children is rather better than in the previous year. In 12-year-old boys the proportion with apparently sound teeth increased from 50 per cent. to 67 per cent. between 1913 and 1923, whilst extensive caries diminished from 10 per cent. to 2·7 per cent. ; a corresponding improvement is shown by girls, who enjoy a higher degree of resistance to caries than boys. As regards adenoids and enlargement of tonsils, there is improvement, only 11 per cent. being affected, instead of 12·8 per cent. in 1922, 16·5 per cent. in 1921, and still higher figures in previous years. This is probably due, at least in part, to lessened oral sepsis and greater attention to dental hygiene. Investigation of two schools by Dr. E. O. Lewis indicates that removal of enlarged tonsils diminishes the risk of contracting infectious disease. In one school it was found that one in nine children with enlarged tonsils had contracted scarlet fever, as compared with one in twenty-eight children with normal tonsils. The proportion of children suffering from defective hearing, as ascertained

at routine inspection, has been halved during the past ten years and is now only 0·7 per cent."

In the *British Medical Journal* of October 18, 1924, Dr. G. E. Friend, Medical Officer to Christ's Hospital, said :

" That at Horsham, the boys had been fed on a bread made from stone-milled flour, containing a varying proportion (from 76 to 80 per cent.) of the whole grain, and during the last two years a certain amount of the bread had been made from a flour containing 96 per cent. of the whole grain. It was found that the boys at first would not eat very largely or for any considerable period of the stronger bread, but during the winter months nearly one-third of the bread was of the 96 per cent. kind. As a result of the use of these breads there had been a great improvement in the teeth. When the school first removed to Horsham the average number of carious teeth per boy found at the annual inspection was 4, now it was 1·5. He could not claim, of course, that this improvement was entirely due to the use of wholemeal bread. In other respects the boys had improved, particularly in weight, though here again other factors came in as well as food. The chief value of the wholemeal flour, in his opinion, was, that it insured proper mastication."

Quoting from the *Journal of the American*

PLATE 12.—TOOTHBRUSH DRILL.
(From *American Journal of Dental Science.*)

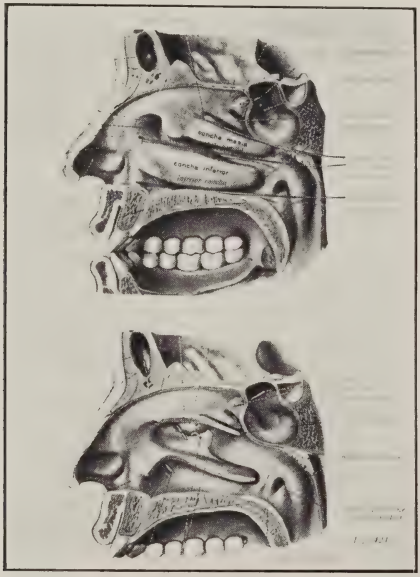

PLATE 13.—ANTRO-POSTERIOR SECTION
THROUGH NOSE AND PHARYNX
(see p. 58).

Dental Association, August 1924, Haidee Weeks Guthrie, New Orleans, Louisiana, says :

" Cleanliness and diet we will all agree are of value. Cleanliness unquestionably is of value. For example, in my own clinic work, fifty children in a day nursery between the ages of 2 and 4 years were selected, instructed how to use the brush, and were seen periodically for two years. At the end of the time there was not a cavity in one of the fifty mouths. . . .

" The first visit of any patient, big or little, rich or poor, to my office or clinic must be accompanied by his toothbrush for a lesson in the use of the brush. I make him show me how he has used his brush, and then by the use of a mirror, which the patient holds, I show him how he has neglected certain parts of his mouth which he has failed to reach, and correct the brushing by a toothbrush drill."

Dr. Leak says :

" His purpose in presenting his paper was to encourage more profound interest among dentists in the case of deciduous teeth. Let me add to that. If you want to get joy and happiness out of your work, start a clinic in a settlement neighbourhood. Study the children and their families. Sociologic problems will arise that you never dreamed could exist in this civilised enlightened world of ours. It will make you thankful that you are living in your sphere and encourage you to right living. Give the child his chance. You start your own clinic, give the best you have to them, to those

not so fortunate as you, and as Dr. Prothero once quoted to us,

> " ' Life is a mirror of kings and slaves,
> It is as you are and do.
> Give to the world the best you have,
> And the best will come back to you.' "

Again in the words of Cordelia O'Neill :

"It is found that about 90 per cent. of the children have from one to twelve cavities. Much of this is attributed to the quantities of sugar consumed, also to the high degree of refinement to which wheat, sugar and other foods are subjected before being placed on the market for public consumption. To counteract this the toothbrush must be called on to supply the friction that foods in coarser form might supply."

A Danish dentist in Copenhagen of very great experience, to whom I had an introduction in 1924, said, that in 1,000 examinations he had only seen six perfect sets of teeth amongst the folk-school children.

A Swede under similar circumstances in Stockholm put the percentage of defective teeth at 95. Possibly they may require a higher standard of perfection than England. Their dental clinics are simply exquisite in every detail, and are at every point an education to the children. No expense is spared and the organisation is the most perfect I have ever seen. The children bring their own tooth-

brushes and are most carefully instructed how to use them.

All starchy and saccharine matters if retained in the mouth are liable to undergo fermentation and generate acids which, as we have already seen, have a solvent action upon the enamel, producing erosions, more especially if its surface be rough and imperfectly formed. Good cane sugar will frequently require from twenty-four to forty-eight hours to undergo fermentation, so that it will most likely be washed out of the mouth before it can have effected any injury to the teeth. But maltose and many other modern saccharides often produce acid fermentation in a few hours. It will be seen, therefore, that the custom of giving children sweets at night is particularly injurious. Children should be taught to wash their teeth the last thing at night with a soft toothbrush and warm water, and then rinse out the mouth with some antiseptic solution such as a drop of Condy's Fluid to half a tumbler of warm water.

The natives of India are in the habit of constantly chewing a combination of lime, catechu and betel nut, which they wrap in a piece of leaf. The catechu acts as a useful astringent for the gums, the lime neutralises any acidity that may be in the mouth, and the nut and leaf give resistance to the teeth and help to cleanse them. These people have remarkably fine teeth.

CHAPTER V

THE HEALTH OF THE CHILD (*continued*)

"The manner of breathing of every child . . . required constant and unremitting attention . . . from the moment of its birth."—Dr. Scanes Spicer.

Respiration

In normal respiration, inspiration and expiration should take place through the naso-pharynx.

The interior of the nose is provided with curled processes of bone to which the name concha or turbinated has been given. These processes are for the purpose of giving increased surface, over which is spread the mucous membrane composed of ciliated epithelium in the lower part of the naso-pharynx, while in the upper back part are the terminal cells of the olfactory filaments, and further this mucous membrane is furnished with numerous hairs with the object of arresting mechanical impurities such as dust, etc., and in those animals who are endowed with a specially keen sense of smell, such as the dog, these bones are much more complicated than in man. These turbinated bodies serve another very important function, viz. that of retaining a

considerable amount of heat and moisture from the expired air which is imparted to the cooler air taken in at each inspiration. Under normal circumstances, therefore, no matter how cold the external atmosphere may be, the air inspired through the nostrils is raised in temperature and moistened before it reaches the larynx. Unfortunately, however, in city life, we frequently find that through the irritating nature of the air breathed the mucous membrane covering these turbinated bones, especially in debilitated children, is so much swollen and thickened that it obstructs the cavity of the nose, and the mucous membrane of the upper part of the pharynx becoming œdematous, gives rise to a low form of growth to which the name adenoids has been applied.

These growths frequently completely block the posterior opening of the nose and the orifice of the passage to the internal ear. The sufferer is then reduced to the condition of a mouth breather, with more or less defective hearing. The passage of the air through the mouth and lower part of the pharynx tends to produce a vacuum in the upper part of the pharynx and back of the nose, and the suction action of the vacuum causes an increase in the height and decrease in the breadth of the arch of the palate, the structures of which in early life are soft and easily mouldable. This narrowing of the arch reduces the capacity of the

alveolar processes, and hence the teeth become crowded and irregular, some of them being forced through the inner wall of the alveolus into the palate, while others project outwards towards the cavity of the cheek or may be arrested in their growth altogether and never erupted.

Further, the mucous membrane of the mouth is dried and irritated by the passage of the inspired and expired air, the gums shrink and retreat from the necks of the teeth, which are already debilitated by the pressure of their neighbours, caries rapidly sets in, and the mouth becomes septic, so that every inspiration is then charged with all manner of impurities from the cavities in the teeth and from abscesses which are formed at their roots, the pus being constantly swallowed with the food and saliva.

Plate 13, Antro-posterior section through naso-pharynx showing turbinated bones with opening of eustachian tube.

Plate 14, Transverse section of cavity of nose showing the turbinated bones and the cavities of the antrums of the superior maxillæ.

Plate 15, Transverse section through nasal cavities showing turbinated bones; the lower figure shows an increasing height in the palate arch with crooked nasal septum.

Plate 16 shows a typical case of what is known as superior protrusion in a girl aged 12. This face presents many points of interest;

FIG. 488.—CORONAL SECTION THRO[illegible]

PLATE 14.—DIAGRAMMATIC TRANSVERSE SECTION OF NOSE AND JAW.

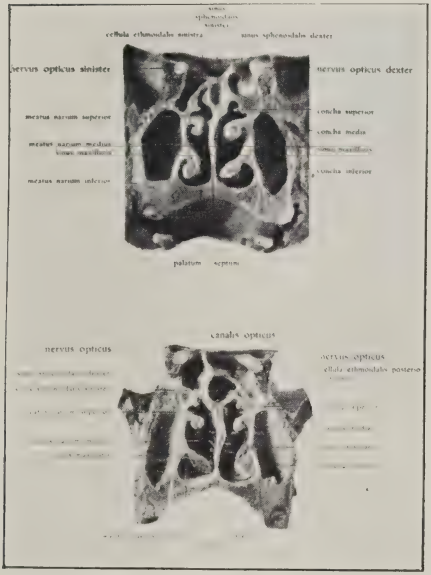

PLATE 15.—TRANSVERSE SECTION OF NOSE AND JAW.

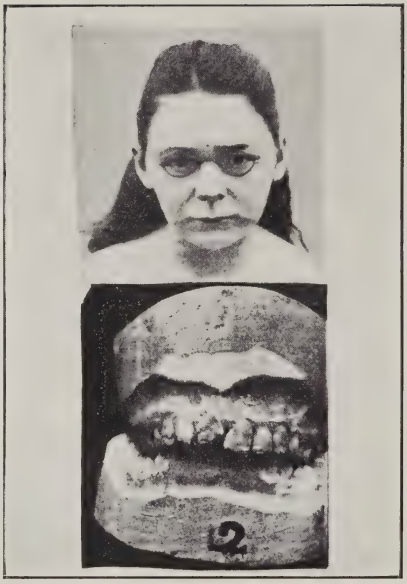

PLATE 16.—SUPERIOR PROTRUSION.

there is an appearance of large frontal development which might be mistaken as evidence of a high order of mental ability, but upon analysis one is forced to come to the conclusion that it is deficient growth of the bones of the face which has thrown the forehead into abnormal prominence. The intense look of concentration in the eyes is frequently seen in these cases. These children are nearly always more or less deaf, and in their anxiety to conceal the defect endeavour to divine your meaning as much by the expression of your face as by your language.

The lines extending from the alæ of the nose downwards and outwards indicate considerable efforts which have been very imperfectly successful at nasal breathing.

On the lower part of the plate we see the casts taken from this child's mouth, showing the upper incisor teeth thrown forward a long way in front of the lower incisors. There is a mark upon these teeth which would suggest that the child had suffered from some severe illness at about four years of age, but as the photograph has been taken from a plaster cast, it cannot be relied upon in this respect.

Unfortunately these children frequently display a great deal of restless mental activity which, in conjunction with the disproportionate development of the forehead, is supposed by the fond parents to be an indication of extraordinary ability, and they will tell you that lessons are

no trouble to her, and that she loves her books, and never tire of enumerating the examinations she has passed. The teacher in the school, who is naturally anxious for a newspaper advertisement, and possibly for result fees, is only too glad to foster this mistaken idea, and the poor child, with the vanity and ambition which is more or less common to all young people, imagines that the eyes of the world are centred upon her, and that she is destined to become one of the shining lights of the age. Her masticatory and respiratory powers are lamentably defective, and sitting up late at night over her books and tossing and turning restlessly in bed, dreaming of her examinations and her lessons, she rapidly wrecks the scanty prospect there might at one time have been of making her a useful and tolerably healthy member of society.

Metz

On Plate 17 we have diagrams from Metz' *Study of the Human Figure.* Metz has reduced the proportions of the human figure as near as possible to a science, and it will be seen that he divides the adult face into four zones, two of which are occupied by the brain case and two by the lower part of the face.

In the child, however, a much larger proportion must be allotted to the brain case, for in early life the brain has to take so active a part

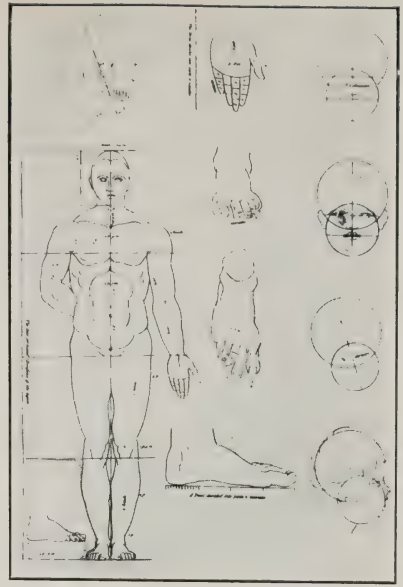

PLATE 17.—METZ STUDY OF THE HUMAN FIGURE.

PLATE 18.—HEALTHY OFFSPRING OF HEALTHY PARENTS.

PLATE 19.—STATUE IN GARDEN OF TUILERIES.

in controlling constructive metabolism that in all dimensions it bears a much larger proportion to the rest of the body than after adult life has been attained. It is, of course, impossible to define the proportions in childhood with the same exactitude that we can lay down in the adult, for the child is a constantly growing and altering quantity, but approximately, if a circle be drawn including the front of the head with the eyes and nose, a second circle of three-quarters the diameter and intersecting the first so as to include the nose and eyes, gives us a very good guide to the proportions of the lower part of the face.

Plate 18 is a photograph of a good average normal child of healthy parentage, and if we apply Metz circles to this child's face, although unfortunately it is not quite a full front face, yet we see that these circles take it in very comprehensively indeed. I knew this child's father and mother and grandfather and grandmother, the latter of whom were particularly strong and healthy people, the grandfather especially being an exceedingly good man, who never indulged in excesses of any kind, and who was always cheerful and calm. This child has now grown into a fine young man whom I last saw a little while ago when he was leaving for Australia.

Plate 19 is a photograph of the back of a statue taken in the garden of the Tuileries.

It is introduced here to give an idea of a normal symmetrical back. The weight of the body is borne upon the left foot, which slightly raises the corresponding hip, and the face is turned to the same side, but it will be observed that the spinal groove exactly corresponds to the curve of the body, and that the shoulder blades are precisely symmetrical when allowance is made for the slightly different angles at which the arms are raised.

Plate 20 is the back of a boy of 11 who, on account of his delicacy, did not go to school, but had home lessons with his brothers and sister. Here again it will be observed that the spinal groove is nearly normal, and that the shoulder blades are almost, if not quite, symmetrical.

Plate 21 is the same child stooping forward, and shows that the curve of the ribs springing from the spine is nearly symmetrical, enabling the right and left lung to expand equally. This is, in fact, a fairly good back. I have recently heard of this boy, now a well-grown, able young man, carrying out most difficult engineering work in America with very great ability.

Plate 22 is taken from a report of the Health Congress at Geneva, 1906, showing deviation of the spine consequent on faulty position when writing.

Plates 23 and 24 are taken from schoolgirls who are not supposed to be particularly crooked.

PLATE 20.—BOY AGED ELEVEN. GOOD TYPE OF SPINE.

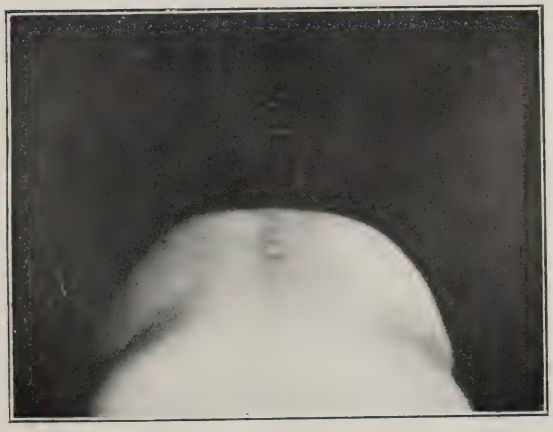

PLATE 21.—THE SAME, STOOPING FORWARD.

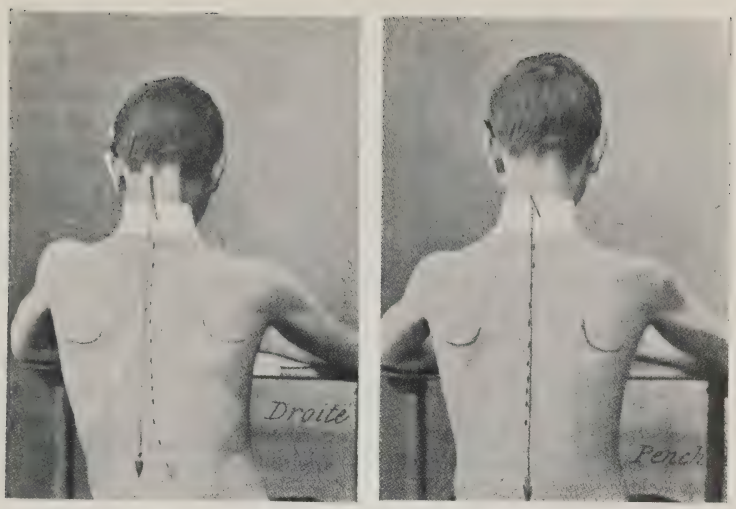

PLATE 22.—PLUMB LINE TO SHOW FAULTY POSITION WHEN WRITING.

PLATE 23.—SCHOOLGIRL NOT SUPPOSED TO BE CROOKED.

PLATE 24.—PROGRESSIVE SCOLIOSIS.

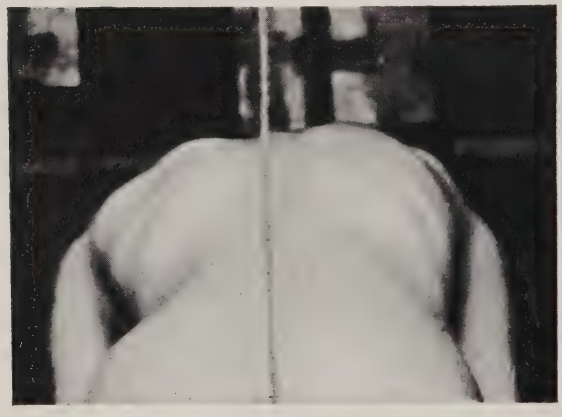

PLATE 25.—PROGRESSIVE SCOLIOSIS STOOPING.

Plate 25 is one of these girls stooping forward to show the irregularities in the curve of the ribs. The line down the centre is a plumb line for comparison. These are not cases of disease, but simply of neglect. The parents and teachers are very often quite unaware that the child is abnormal in any way; the dressmaker or tailor putting a little padding here, and cutting out a bit there, makes the child when dressed appear tolerably straight, and in these countries we are so used to seeing crooked people that we take no notice, until the matter is forced upon us, and can scarcely be persuaded that there is a corresponding loss of both mental and physical efficiency, and do not realise the handicap in case of an attack of pneumonia, bronchitis, congestion of the lungs or tuberculosis, etc.

These cases nearly always begin by the child being kept too long periods sitting over a desk or table; the muscles upon one side grow a little weary, and then the spine begins to sag, and every day longer is only a day worse.

It should be borne in mind that physical deformity must cause not only some compression, dilatation or displacement of the internal organs, such as heart, lungs, stomach, kidneys or liver, but also must be represented by a corresponding disturbance in symmetrical development of the brain.

Plate 26 represents a desk and chair which

have been devised to meet some of these objections. The cushion or pad at the back of the chair can be raised or lowered to support the hollow of the back. The footboard is adjustable to support the feet, and the desk itself can be raised or lowered so as to make the child hold his head up. This is certainly a step in the right direction, although there is still room for improvement in this apparatus.

Plate 27 shows the interior of a Swedish gymnasium. In even quite small towns in Sweden there is a gymnasium, under the management of a Government gymnast. The children and adults attend regularly at various hours. Contracted chests, incipient spinal curvature, flat foot, and other deformities are placed under suitable treatment. The object of the Swedish gymnast being to develop the essential organs of digestion, respiration and locomotion, but to avoid hypertrophy of any group of muscles which can only result in disturbance of the balance of nutrition and subsequent compensating atrophy.

Plate 28 shows a Swedish gymnast putting a boy through movements to correct a spinal curvature.

The report already referred to, London 1921, is again of interest in this connection.

" The girls at secondary schools are rapidly growing and are particularly liable to defects

PLATE 26.—DESK AND CHAIR TO CORRECT FAULTY POSITIONS.

PLATE 27.—SWEDISH GYMNASIUM.

PLATE 28.—SWEDISH GYMNAST AT WORK.

of growth connected with adolescence. . . . No less than 16·7 per cent. were noted with postural deformities of the spine, including round shoulders, stooping as well as slight degrees of lateral curvature ; 7·1 per cent. also were noted with flat feet."

Unfortunately, in most countries the old methods still prevail, and the world continues to be crowded with people who are either eccentric and wholly unreliable, or who have degenerated into mere machines, and only too many of whom are never safe except in a Criminal Lunatic Asylum.

The Annual Report of the Board of Control for 1923 states:

"On January 1, 1924, the number of notified insane persons under care in England and Wales was 130,334, an increase of 4,055 on the number on January 1, 1923.

"This increase is the largest we have ever recorded, and may be compared with increases of 2,565 in 1922, of 3,370 in 1921, and of 3,580 in 1920 ; but it by no means necessarily denotes any increase in the incidence of insanity among the general population.

"The relative percentage distribution of the sexes—males 43·9, females 56·1—shows a further slight reversion towards the proportions which obtained immediately before the war, viz. males 46·2, females 53·8.

"Apart from the insane in all Poor Law institutions, and in receipt of outdoor relief,

there were in other institutions at the beginning of 1923, 106,247 patients. Fresh admissions during the year brought the total up to 132,478.

" Sir Frederick Willis, chairman of the Board of Lunacy Control, stated that the accommodation in this country for all classes of lunatics would be quite used up in a year."

The Heart

Plate No. 29 represents what is known as Pascal's Experiment. Pascal was one of the greatest of philosophers, and one of the best of men that the world has ever seen. He is stated to have said, " Man was either the glory or the scandal of creation," and while in physiological researches every thoughtful mind must be struck by the great glory and wonder of the design, yet in pathological conditions we must, I think, admit that man has, indeed, become the scandal of creation.

We see here that a long narrow tube has been fixed into the top of a barrel, and when the fluid reached a certain height in the tube, the barrel was burst asunder. Now, the actual weight of the fluid in the tube is very little, and the strength of the barrel is considerable : it is, therefore, not the weight of the fluid but the pressure which has brought about this remarkable result, and it is due to a law in hydrostatics, known as Pascal's Law, that

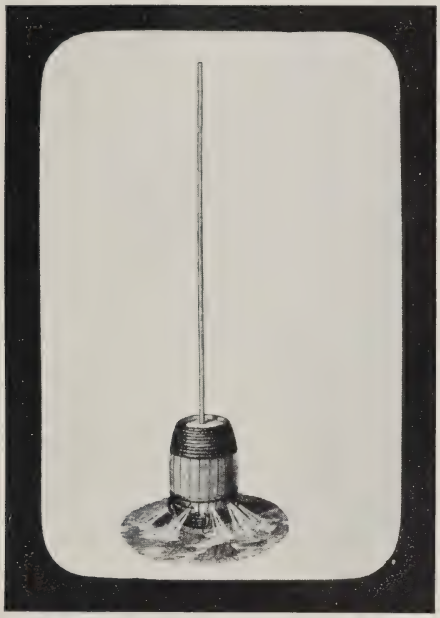

PLATE 29.—PASCAL'S EXPERIMENT.

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"Fluids exercise pressure equally in all directions, equal for equal surfaces, and at right angles to those surfaces," and that "The pressure of any column of fluid is equal to its height multiplied by its base quite irrespective of the quantity of fluid in the column."

We see, therefore, that if the surface of the bottom of the cask be represented by 100 and the depth by 10, the pressure will be equal to 1,000. But if into the top of the cask you introduce a tube, the height of which is, let us say 30, the surface remaining the same, we will then have 30 + 10 (height of cask and tube) = 40 × 100 = 4,000.

The mechanical conditions under which the heart in man works are similar to those which obtain in the cask and tube we have just been considering. In the lower animals, the head is very often on a level with or even below the heart, but in man in standing, walking, or sitting positions, there is a vertical column of blood varying in height, according to the stature of the individual, from the top of the interior of the cranium to the bottom of the left ventricle, and this column of fluid has not only to be upheld, but to be forced upwards at every contraction of the ventricle.

Now, the normal function of muscular tissue is to overcome resistance, and as long as we are well within the limits of nutrition, the contractions of the heart will, so to speak, cheer-

fully overcome the pressure within its cavity, and the vertical column of blood in the vessels under consideration. But as soon as the muscular fibres tire, they will be unable to counterbalance the pressure, begin to stretch, the heart to dilate, and finally may become absolutely incompetent, and perhaps permanently damaged, if kind Nature does not intervene, making the individual fall down by some attack of giddiness or faintness, which relieves the pressure by forcing the sufferer into a horizontal position, and so allowing the muscular fibres to recover themselves.

The London Report for 1921 says under the heading "Girls and Home Lessons": "The medical inspection in secondary schools, which is permissive, continued during 1921, and 10,833 students were inspected." The report is thus enabled to institute interesting comparisons.

"In regard to nutrition, clothing and personal hygiene, a marked superiority of secondary school children over the children generally in elementary schools was shown.

"Ailments of the nose and throat and defective vision are found to be more prevalent in elementary schools than in secondary schools. It is noted that 5 per cent. of the girls in secondary schools suffered from heart defects, and 7·8 per cent. from anæmia. This seems a high proportion, as it is much above the elementary school numbers. There is, no doubt, however,

that home work and preparation for examinations tell very hardly upon many girls who are found in a neurotic condition and in a depressed state of mind."

But the point of importance for us in the present connection is that the fall of the tidal energy in childhood is very pronounced between the hours 11 a.m. and 1 p.m. (see Plate No. 1, page 20), and that if we would follow the suggestion of Dame Nature, we would make all children lie down for at least an hour about this period of the day, as the muscular structure of the heart in the growing child is particularly liable to dilatation, and allow them to resume either work or amusements as the afternoon tide of energy re-establishes itself.

At a school recently visited, a number of young children were leaning forward upon their desks asleep. The teacher had observed that they worked much better after a short rest, and if the advantages of the horizontal position had been fully understood very great benefit would result from even a short period snatched from the middle of school work, but when, instead of lying down and taking all strain off the heart, trunk and limbs, the weight of the head and shoulders has to be borne by the soft bones of the chest compressed upon the desk, and the spine and limbs allowed to assume any irregular position, it is likely that more harm than good will result from what otherwise might

easily have been an excellent move in the right direction.

In Stockholm the school hours begin at 8 a.m., but most of the schools require the children to assemble for prayers at 7.45. They return home about 10.45 for their midday meal and back to school again at 1, remaining till 2.45 or later for special classes.

The system of not allowing children to remain in any classroom more than 45 minutes in each hour, not only obviates the dangers arising from prolonged sitting and relieves the muscles, especially of the eyes, which are necessarily kept tense by looking at near objects, but also enables the rooms to be thoroughly ventilated and the children to get free use of their limbs in the open air.

Temperature

I need scarcely remind you that all biological processes require a certain amount of heat.

The familiar expression, "cold-blooded animals," is only a comparative one, and merely means that the temperature of the blood of these animals is very little, if at all, above that of the medium in which they live, but does not indicate the absence of heat. The freezing of water on the surface at low temperature is a remarkable phenomenon; as it is a violation of the rule that bodies, whether solid, liquid

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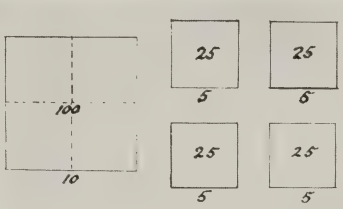

Cold air contains a greater quantity of oxygen than the same volume of warm air. A cubic foot of dry air at 32 Fahr. weighs 566.85 grains which neglecting the slight amount of carbondi-oxide present gives 436.5 grs. of nitrogen and 130.35 grs. of oxygen.

At a temperature of 100 Fahr. a cubic foot of dry air weighs 498 grs. and is made up by 383.5 grs. nitrogen and 114.5 grs. oxygen. If a man breathes 16.6 cubic feet (which is about an average) per hour, he will receive at 32 Fahr. 2164.2 grains oxygen, while at a temperature of 100 Fahr. he would receive only 1901 grains oxygen, or nearly 12% less than at the lower temp.

PLATE 30.

or gaseous, contract under the influence of cold and expand with increasing temperature. Water follows this rule down to 39½° F., but then begins to expand, and at the moment of changing into ice expands suddenly with great force. If it were not for this, water would freeze from the bottom, rivers and lakes become solid, the fish would be killed, and only in the lower latitudes would the summers be long enough to thaw the dense masses of ice.

Heated bodies when placed in a cooler environment tend to lose their heat by processes of evaporation, radiation and conduction, through those surfaces which are exposed to the lower temperature. Hence the greater the surface the more rapidly the body will cool. The old country woman who pours her hot tea into a saucer gives practical demonstration of this physical law, for the surface exposed in the saucer is greater than that in the cup, and hence the tea will cool more quickly.

Plate 30 is a diagram to demonstrate the relationship of circumference to contents. The large square has a contents of 100 to four sides of 10 each, that is 40, while if it be divided into four small squares where marked by dotted lines, each of them will have a contents of 25 to four sides of 5 each, that is 20 ; it is evident, therefore, that the smaller the mass the greater the proportion of surface to contents, and this

is even more pronounced when dealing with three dimensions.

It will be seen, therefore, that if you take a man of 12 stone weight and four children of 3 stone each, the four children will expose a much greater cooling surface, than the one man, and yet it is quite common to see the man fully clothed, with perhaps a high collar, two shirts, a waistcoat, undercoat and overcoat, thick trousers, heavy boots and gloves, and at the same time the children with only thin petticoats and dress, short socks, low shoes and even sometimes bare arms and neck. The mother, if remonstrated with, will probably tell you that she does not believe in coddling the children, and that she means to rear them hardy, and she is so confident of her superior knowledge that she will probably ridicule any arguments that you may bring forward and will not believe you when you tell her that her child is full of rheumatism, for it is only those who have given special attention to the subject who are fully aware that rheumatism is probably the most common, and the most latent, of all the diseases of childhood. The so-called growing pains which seem to be taken as a matter of course, are simply rheumatism. The nervous twitchings, often called St. Vitus' Dance, are in many cases rheumatic, and even where attributed to nerve shock, there is probably a rheumatic condition, although not

so easy to recognise; while certainly the majority of sore throats, coughs, bronchial attacks and headaches are rheumatism.

I must, therefore, urge you at all times to press upon those who are in charge of children to keep the surface of the body well covered, preferably with woollen material, but all waterproofs tend to confine the insensible perspiration, render the wearer more liable to chills and are only excusable in heavy rain. By all means let the children be out in the air, no matter how cold the air may be, but see that they breathe through the nose, that the body is warmly clad, that the child has food at reasonable intervals and has had plenty of rest.

We have already seen that a cubic foot of dry air at 32° F. gives 130·35 grains of oxygen, but at 100° F. only 114·5 grains, so that in ordinary respiration there would be a difference of about 12 per cent. of oxygen.

Now as all the processes of life are more active in childhood, it is of great importance that at this period the supply of oxygen should be plentiful, and hence, other things being equal, the breathing of cold air is more beneficial than that of warm air. But, on the other hand, it must be borne in mind that heat represents tissue, and that if the child is already low or exhausted by fatigue, or want of food, very cold air, even though it be pure, may be a danger. If, however, the child be really

free from rheumatism he will probably, although fatigued and hungry, not catch cold *if he breathes through his nose.* I find it necessary to emphasise this latter point, because so many children in modern times are suffering from enlarged tonsils, adenoids and chronic rhinitis, that they have become confirmed mouth-breathers.

Dr. Scanes Spicer says :

" As a matter of fact, the manner of breathing of every child, just as much as its food and clothing, housing and air, exercise, bathing and education, required constant and unremitting attention in these climates from the moment of its birth. When this was done systematically, daily attention being given to the breathing, ' adenoids ' and allied deformities would be rare."

Undoubtedly the brief application of cold to the surface, as in a sponge bath, quickly applied, followed by a brisk rubbing and warm clothes, will do a great deal to harden and invigorate a child. The *modus operandi* of the cold bath has been dealt with on page 38, ante-natal existence.

It is sometimes objected that the slum children, who are nearly naked, are often more healthy than the children of the small shopkeeper and artisan, but it is evident that this is not due to the nakedness, but to the more

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PLATE 31.—SLUM CHILD.

healthy occupations of the parents of the slum children, who are almost always labourers or hawkers, out in the air all day long, and have less care on their minds, as they have very little to lose—" He that is down need fear no fall "—while the shopkeeper is confined in an unhealthy atmosphere all day, and the artisan in closed-in workshops, or at plumbing, gas-fitting, or laying drains, etc.; besides, these latter object to their children playing in the open street.

Quoting again from Dr. Dick in *School Hygiene*:

" It is not a question of food, but of the deprivation of fresh air, exercise and sunlight which profoundly alters the metabolism of the child and produces aberration in the growth, not only of the bones and teeth, but in probably every tissue of the body."

It must, however, be borne in mind that there is a much greater death-rate amongst the slum children than most people are at all aware of.

Plate 31 is a type of child only too frequently met with in our cities. She is about 13 years of age, although not looking more than 9 or 10, much below the average weight and height, has adenoids, enlarged tonsils, contracted chest, dilated colon and stomach, a septic mouth with decayed teeth, kyphosis and lordosis, flat feet, crooked legs and a verminous head. Such

cases are generally sent to hospital to have adenoids and tonsils removed and then to a country convalescent home for a few weeks. The teeth will receive attention, and she will return to her routine slum life to come up again for medical examination once or twice perhaps. The school doctor's heart sinks within him as he looks upon her with " sad yet watchful eye," knowing quite well that some years continuous treatment would be only too little, but the organisation to carry it out is not provided in these countries, and the rate-payer would rave and storm at the mere suggestion of such a thing, failing completely to grasp the difference to the community between a possible economic worker and a lifelong burden on the rates, a distributor of disease, and a probable recruit for the ranks of the drunkard and criminal.

" There is that scattereth and yet increaseth ; and there is that withholdeth more than is meet, but it tendeth to poverty."

These cases are conspicuous by their absence in Scandinavia. I do not think you could find a child of this kind in Stockholm, Copenhagen or Christiania (now Oslo). She would have been caught at about 6 years of age, before her troubles were anything like established, sent to an open-air school, and with swimming baths, regulated meals, careful training in special gymnastic courses, and at least five

weeks each summer in a country colony, also perhaps a few weeks at Easter and Christmas, an extraordinary improvement is soon recognisable.

Many of these cases, although caught early, will be under continuous treatment for three or four years or even longer; but the brand is snatched from the burning, and will often result in the addition of a useful citizen to the community.

CHAPTER VI

THE HEALTH OF THE CHILD (*continued*)

FOOD AND HOW TO TAKE IT

"Better is a dinner of herbs where love is than a stalled ox and hatred therewith."

UNDER this heading we must first consider a few of the practical points about breast-feeding.

It should be laid down as a rule that all infants ought to be breast-fed, and that this is of as much importance to the mother as to the child. Although the process of breast-feeding is a natural one, there are some simple points which are too often neglected.

In the first place the nipple should be carefully cleansed and a little of the milk pressed out of the ducts each time before it is put in the child's mouth, as the fluff off clothes, old broken-down epithelium cells, and other deleterious matter will have accumulated on the nipple and in the opening of the ducts, which may be productive of thrush and other unhealthy conditions of the child's mouth.

In the second place it must be borne in mind that in justice to the child, the nursing woman should pay particular attention to her dietary, and should avoid all stimulants, not only

alcohol, but also tea, coffee and condiments, such as pepper, mustard, spices, etc.

There is a popular belief that porter increases the quantity of milk, and this is probably correct, but quality is far more important than quantity, and excessive secretion is almost always an indication of debility in the secreting organ, and should a breast-fed child become constipated or display other evidence of gastric disturbance, the milk of the mother should immediately be analysed and measures taken to restore the ingredients which are deficient. Personally I have great faith in small doses of cod-liver oil, and perhaps a little lactophosphate of lime, as with the majority of mothers who have the misfortune to be obliged to bring up their children in large cities it is mostly in the fats and lime-salts that their milk is likely to be defective.

In modern times, however, a certain proportion of mothers which, I am sorry to say, seems to be increasing, are quite incapable of nursing their infants, and are tempted to fly for refuge to some of the thousand and one artificial foods which are advertised in almost every paper. But most medical men who have given special attention to the subject, are now unanimous that the safest artificial feeding is simply cow's milk (provided it can be got pure and clean) diluted with either a little pure water or weak barley-water, with the addition of a little cream and lactose if necessary.

Milk

Hitherto, I regret to say that anybody was considered good enough to be a dairyman, no matter how ignorant or how dirty, and the poisonous state of the milk supply of large cities suggested the adoption by municipal authorities of sterilisation by heat on a large scale, and there is no doubt that a temperature of 220° F. will kill almost all bacteria if it be maintained for about half an hour. But this temperature kills not only our enemies, but our friends, deteriorates the fat and the sugar, and completely destroys the diastatic properties upon which depend much of the subsequent assimilation.

It has, therefore, latterly been modified by the process which is now known as Pasteurisation, that is, a maximum temperature of 175° F., but even at this temperature there are many changes by which we lose much of the nutrient quality of the milk.

We, however, destroy the bacteria of typhoid and diphtheria, and probably scarlet fever, but the bacillus tuberculosis, although it seems somewhat enfeebled, has still vitality up to 185° F. (Conn.)

Unfortunately, however, at this temperature, we have destroyed all the lactic acid bacilli to whom we must look as our friends, not only to produce normal digestive changes in the milk, but also to arrest the development of those

bacteria which may be produced from the spores which are quite resistant of temperature up to 220° F.

Some years ago I was sent for to see an infant about four months old who was failing in what the parents considered a very unaccountable manner. His mother declared that she could not nurse him as she had practically no milk from the time of his birth. He lived in a fine house, healthily situated, surrounded by its own grounds on the side of a hill. They had their own cow, and there seemed to be everything in favour of the child, and yet he was becoming steadily more and more attenuated and presented all the appearance of advanced marasmus. Enquiries about the milk and the cow were mostly satisfactorily answered by the father, who was a most intelligent man, and who concluded his statements by saying, "We sterilise it carefully." I asked at what temperature. "Oh, I don't know the exact temperature, but we were told to keep the bottles in boiling water for twenty minutes." I told him to get a thermometer fixed in the steriliser, never to allow the water to boil, but as soon as he saw the temperature rise to 145° F. to turn down the lamp and keep the milk between 145° and 150° for about twenty minutes. I explained to him that at that temperature the lactic acid bacilli, which were his greatest friends, would still be spared.

These were all the instructions given. In a few days the child began to show improvement, and is now an active young man in college. The miserable white fluid which survives these higher temperatures does not deserve the name of milk, and the Danes, who were amongst the first to introduce sterilisation, have now practically given it up.

The damaging effect of heat has induced experts to seek remedy in the opposite direction, and it has been found that if the milk is cooled to a temperature of about 40° F. immediately on being procured from the cow, micro-organisms do not develop, and that if care has been taken to ensure perfect cleanliness, to receive the milk in properly constructed vessels through a sterilised strainer, and to seal it up while still cold in suitable sterilised bottles, from which all air is excluded, it can be kept perfectly pure and fresh for weeks. I have recently heard that 8° Celsius is the temperature defined by the Authorities in Copenhagen.

With this object a can is constructed as shown in Plate 32. This vessel is made in one piece without seams, the angles are replaced by curves, and inserted into the bottom of the vessel there is a large globe which is closed by a screw cap. In this globe a quantity of ice and salt is placed, and the milk, which is received direct from the cow in a very carefully constructed strainer, composed of fine gauze and

PLATE 32.—SEAMLESS MILK-CAN, WITH REFRIGERATING CHAMBER.

PLATE 33.—WASHING AND DRESSING BEFORE MILKING.

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sterilised cotton-wool, protected by a shield, passes into the vessel below, and is reduced to a temperature very little above freezing. Even the abolition of the angles in these cans is a most important improvement, for no matter how you try to empty a vessel in which angles exist, there will always be a certain amount of fluid retained at the angles.

It is to be regretted that in these countries we are so frequently left behind in the race, and for some years I have been protesting, without any apparent effect, against the barbarous condition of our milk supply, but at length we appear to have arrived at the dawn of better things, and the work is being taken up by educated gentlemen.

I am indebted to the proprietor of the Ballinteer Dairy for photographs taken on his premises. In Plate 33 we see men washing their hands before going to milk; there is a notice posted up that all milkers must wash their hands before and after milking, and the foreman is standing by to see that they do it. They wear long clean aprons, which cover all their clothes, and sleeves on their arms, which are tied close in round their wrists, so that it is not possible for any part of the clothing to come in contact with the cow's udder, or to drop particles of dust into the milk, which they are handling or stooping over.

Hitherto, in these countries, it has been the

custom to milk into an open can; hairs from the cow, dirt off the milker's sleeves, pieces of hay and straw, dust and flies all accumulated in the can during the process, and often *lay* in the milk for an hour or more before it was passed through a strainer. Now, however, the whole top of the can is closed in by the strainer, and all such objectionable matters are excluded.

Many dairy people will tell you that their cans must be clean because they are washed with boiling water. If you take an ordinary milk-can, with the sharp angle to which I have referred at the junction of the side and the bottom, you will see that when you endeavour to empty the can a certain quantity of milk still adheres to this angle, and that it is practically impossible to displace it. When a kettle of boiling water is taken off the fire to wash the can the temperature of the water begins immediately to fall, and by the time the stream of water has struck the wall of the can it is probably well below 200° F. When it reaches the residual milk, in the angle to which we have referred, its first action will be to coagulate the albumen of the milk, and this will protect any bacilli and spores which may be lodged towards the apex of the angle. Now, it takes a temperature of over 185° F. to kill the ordinary tubercle bacillus, while it takes a very much higher temperature to have any effect at all upon the spores. We can, therefore, see at a

glance that the so-called boiling water is absolutely futile to cleanse a milk-can of this construction. On large dairy farms where the expense of a more complete equipment can be met, the cans may be sterilised by prolonged exposure to steam, but all cans should first be washed out with cold water.

Dr. Savage, as reported in the *British Medical Journal*, September 20, 1924, says :

" The inadequate time allotted to the teaching of health factors, including the value and use of foods, to our school-children is a standing disgrace to our educational system. We turn out children from school with much knowledge which disappears with remarkable rapidity, but we do not see that they leave school with a knowledge of the fundamental basal facts of physiology and hygiene, which would not be forgotten if adequately taught, and which would be a guiding light for the rest of their lives. For this inadequate instruction I feel the Board of Education is primarily at fault, since this branch of instruction is not insisted upon as an essential subject, but is merely taught, when taught at all, as odd lessons to fill up class intervals in the school programme. I am aware that many teachers are not instructed themselves in this work, but that should be remedied, and soon would be if this branch of education received the fundamental place which its importance entitles it to receive.

" At present we have plenty of food stunts,

but little food education. Some of the foods foisted on the public by persistent advertising would never earn the money to pay for the advertisements, but for the credulity based on ignorance of food matters, which they so cleverly exploit."

As Professor Paton puts it, the " study of the diet of the labouring classes in the city of Glasgow," carried out by himself in conjunction with Miss D. E. Lindsay, B.Sc., " shows that ignorance and bad marketing, as well as penury, play their part," while he adds, in regard to certain diets found, " they encourage the hope that the teaching of the value of different foods and a training in marketing and cooking in schools may have an influence in the future." Any measures to improve these habits should yield a greater return in a healthier community.

Dr. J. H. Sequeira (*British Medical Journal*, September 20, 1924) :

" Dietetics is a difficult subject to expound to the uneducated. It needs a basis of physiological knowledge to appreciate it. That blessed word ' calories ' is not easy to explain, while difficult to evade. For this reason we need teachers who really understand and who are not merely armed with a veneer of technical knowledge over a basis of nothing. The lack of adequately trained teachers is probably our greatest difficulty, but one which is not insurmountable."

PLATE 34.—GROUP OF IRISH SCHOOL-CHILDREN.

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We cannot leave this part of our subject without uttering a note of warning against the exceedingly dangerous practice of plucking heads of corn in the fields and chewing the raw grain. The micro-organism of a very terrible disease—actinomycosis—which is often mistaken for cancer, frequently develops in the outer coatings of grain and grass seeds, and will readily obtain admission to the blood through decayed or broken teeth.

It cannot indeed be too strongly urged that the utmost possible care is necessary, in dealing with uncooked foods, fruit, vegetables, shell-fish, etc., as poisonous micro-organisms and spores may readily be conveyed into the system, and many violent outbreaks of typhoid fever, tuberculosis and other diseases are directly attributable to this cause.

To establish anything like a law, we must accumulate a large number of examples, and it therefore is necessary, if we would arrive at any sound generalisations, that we must compare as large groups of children as possible, and if these groups are taken from children whose lives are spent under different circumstances, they are more likely to be of use to us.

For Plate 34 I am indebted to Miss Carr of Northbrook Road, Dublin. In it we have a large mixed group of Irish children, and here we are at once struck by the preponderance of the brain case over the lower part of the face,

and although I think we must admit that the average development of the calvarium (or brain case) in these Irish children is certainly large, yet the diminutive proportions of the face undoubtedly tend to exaggerate this appearance.

For Plate 35 I am indebted to Pastor Pullen of the Spezia Mission. It is a group of Italian boys and girls, taken from what we know in these countries as slum children. If we apply the circles suggested by Metz, we will see that the lower part of the face in these children is remarkably well developed. In other words, that the naso-pharyngeal and superior and inferior maxillary regions have maintained their full proportion of growth. Plate 36 is a group of Italian girls averaging a little older than the preceding, and illustrating these points even more clearly.

The question naturally arises, to what is the difference due? And although there are no doubt many contributory causes, I am disposed to ascribe it principally to the climate. The lower class people in Italy are very poor, very ill-fed, and very dirty, but the climate is dry and warm, and the children spend nearly all their time in the sunshine and open air, and probably suffer very little from rhinitis or naso-pharyngeal obstruction.

No doubt the bread commonly used by the Italians is coarser and tougher and necessitates

PLATE 35.—GROUP OF ITALIAN SCHOOL-CHILDREN.

PLATE 36.—GROUP OF ITALIAN SCHOOL-CHILDREN MORE GROWN.

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more chewing, and language may also possibly be contributory to some extent.

While on the subject of the Italian child I must remind you of the splendid results attained by Dr. Montessori amongst Italian children of the lowest classes, which demonstrate what can be done even under the most adverse circumstances, if we have a sound grasp of the fundamental principles of our work and are wholehearted in our efforts to carry out the details. But then, Dr. Montessori has studied anatomy and physiology and appreciates the neuron, the only foundation on which we can hope to build up a sound system of education.

CHAPTER VII

BRAIN

"As a man thinketh so is he."

If now we assume that we have a sufficient stream of healthy blood, and that we are provided with all the physical accessories of digestion, respiration, etc., necessary for its maintenance, the next physiological consideration which must occupy our attention will be the development of the special organ by which our moral and mental faculties are capable of placing themselves in communion with our material surroundings; in other words, we must now consider for a few moments the development of the centres of the greater brain or cerebrum, in which sense we will continue to use the word brain; and here we feel that it must be distinctly understood that this is not in any way a scientific treatise, and that for the sake of simplicity and in the hope of making our line of argument more clear, we propose to concentrate our attention upon that portion of the great nervous system (the cerebrum) which is more directly concerned in the intellectual processes of our daily life. There are,

as a matter of fact, practically two brains: the cerebellum or lesser brain, which is principally concerned with the animal life of the individual and with the marvellously complex reflex cycles, which stand between the more rudimentary reactions to an environment of a physical nature and the higher correlation centres of the cerebrum which enable the intelligence to exercise selective control over the stimuli received and adjust the responsive action of mind or body. Fortunately, however, both these brains, together with the spinal cord, are so intimately united and so similar in nutritional development, that they may in this respect be considered as a whole, for it is proved to a demonstration, that they are alike responsive to the same physiological or pathological conditions.

There is evidence to show that certain parts of the brain are specially endowed with certain special functions, and also that sufficiently defined localities in the brain preside over or are roused into activity by certain definite movements of the muscular system.

Herrick tells us the cortical centres in man are more intimately concerned in postural adjustments than in the lower animals.

The brain may, therefore, be compared to a workshop in which a number of different processes are carried on in different departments, the whole tending toward the com-

pleteness of the finished article. And we see that when injury or disease affects certain portions of the brain, the corrective power which that particular portion would possess is lost to the individual, and if it be one of the portions essential to mental operations, his conclusions will be ill-balanced and incorrect.

Havelock Ellis, who is one of the greatest authorities on criminology, has arrived at the conclusion that the two conditions most frequently associated with criminality are an unsymmetrical brain and loss of self-control, and it is probable that these conditions are more or less associated and dependent upon one another, for even in those cases where lack of symmetry is not discernible externally, yet there may be unsymmetrical development from internal disturbance of nutrition or association.

In deaf mutes the left temporal region is sometimes markedly flattened, almost hollow, while in those who are gifted with unusual powers of eloquently expressing themselves, this region is more prominent than on the right side.

It is, therefore, evident that if we would aim at having a healthy mind, we must begin by having a healthy body, and that upon this as foundation we may reasonably hope, under suitable circumstances, to build up such a healthy condition of brain development as may lay the physical basis for a strong and sound mind.

Locke has compared the human understanding in early childhood to a sheet of blank paper, upon which impressions are written as the intelligence of the individual develops and observations are multiplied.

Observations may be considered under two headings, " Physical " and " Intellectual." The physical (such as seeing, hearing, feeling, etc.) are always the first to be made and hence early life has been provided with much keener sense of sight, hearing, feeling, etc., and upon the use that is made of these, and the character of the impressions produced, depend much of the subsequent intelligence and usefulness of the individual.

Dr. Montessori's success has been principally due, not only to her love of children, but also to her recognition and skill in taking advantage of, and training these attributes in early childhood.

All observations are, however, common in being accompanied by a determination of blood to the particular nerve-centres which are called into play at the moment. In illustration of this flow of blood to the region of special activity, experiments have been performed in the following way : A man has been made to walk for some distance, endeavouring to keep his mind as free from concentrated thought as possible ; he has then lain down upon a well-balanced table, and it has been observed that,

as he concentrated his mind in thought, and kept his limbs at rest, his head gradually sank and his feet rose.

Huxley tells us: "everywhere all over the body, the nervous system by its vaso-motor nerves is continually supervising and regulating the supply of blood, sending now more, now less, blood to this or that part."

This determination of blood is proportionate to the degree of the stimulus applied; but an equal amount of stimulus applied to a nerve-centre that has already been frequently stimulated, within the limits of nutrition, does not produce an equal amount of determination to that of a nerve-centre stimulated for the first time. In other words, the nerve-centre, having become more developed and capable of generating a considerable amount of energy within itself, acts promptly, and without making so much demand upon the blood as was necessary in an earlier stage.

At first the physical stimulus sensibly calls for the volition or will-power necessary to initiate the impulses which result in the intelligent adaptation of means to an end; but, subsequently, the process becomes automatic, and although it is probable that the intellectual centres are stimulated to some degree, yet it is so slightly as not to be a tax upon the consciousness of the individual, and hence it is not followed by the fatigue or waste of tissue

which is inseparable from any effort requiring not only an elaborate co-ordination of forces, but also the exercise of a considerable amount of volition and concentration of the higher nerve-centres.

From the foregoing, it will be readily understood that frequently repeated stimuli of a similar nature, causing repeated determinations of blood to the part, are followed by development of that part, which, so long as the limits of nutrition are not exceeded, tends to become permanent; and that hence the individual will subsequently be able to discharge the particular function associated with the special centre, almost without the exercise of will or consciousness, and, consequently, with a minimum of fatigue. This desirable condition is more especially attainable if the process of training or repetition of duly regulated stimuli be had recourse to during the early periods of life, when not only are the senses quick to observe and comprehend, but all developmental processes are carried on under the most favourable conditions.

We can thus readily explain the much greater rapidity and accuracy with which the young acquire the power of manipulative or other movements than those of more mature age; for not only are the perceptive faculties much keener and quicker, but the blood is richer in nutriment, and the rapidly growing tissues

CHAPTER VIII

BRAIN (*continued*)

THE brain is not the man, no more than the wheels of a locomotive are the engine, yet just as well-made and strong wheels are necessary to the special function of the locomotive, so a strong and well-developed brain appears to be necessary to any marked manifestation of intellectual power.

Plate 37. The brain viewed from above is oval in its general outline, and is divided down the centre by a longitudinal fissure into what are known as the right and left hemispheres. The first point we would like to emphasise is that the brain has two sides. It will probably be replied that everybody knows this; then by all means let us practise what we know. The right side of the brain is associated with the left side of the body, and the left side of the brain with the right side of the body. By giving undue precedence to the right hand in childhood and early youth we not infrequently fatigue the left side of the brain, while we neglect the right side. The second point is that the brain has two functions. The primary function

PLATE 37.—OUTER SURFACE OF BRAIN VIEWED FROM ABOVE.

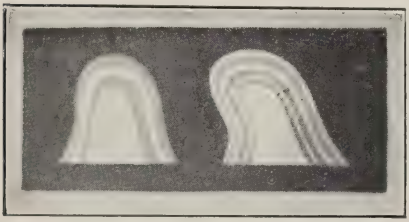

PLATE 39.—SECTION OF CONVOLUTIONS SEPARATED OUT (see p. 103).

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of the brain in early life *is not psychic*, but is to control the movements and nutrition of the different parts of the body, hence the proportion of the brain to the body is much larger in infancy and childhood than in adult life. If we make demands of a psychic nature at too early an age, we divert energy from the control of nutritional metabolism to imperfect psychic processes, and arrest normal growth of the tissues of the body and limbs.

Herbert Spencer says :

" Nature is a strict accountant, if you demand of her in one direction more than she is prepared to lay out, she balances the account by making a deduction elsewhere ; if you will let her follow her own course, taking care to supply in right quantities and kinds the rare materials of mental and bodily growth required at each age, she will eventually produce an individual more or less evenly developed."

And again :

" While it is a familiar truth that a forced development of intelligence in childhood entails either physical feebleness or ultimate stupidity, or early death, it appears not to be perceived that throughout youth the same truth holds, yet it unquestionably does so. There is a given order in which, and a given rate at which the faculties unfold ; if the course of education conform itself to that order and rate, well ; if not, if the higher faculties are early taxed by

presenting an order of knowledge more complete and abstract than can be readily assimilated, or, if by excess of culture the intellect in general is developed to a degree beyond that which is natural to its age, the abnormal advantages gained will inevitably be accompanied by an equivalent evil."

The outer surface of the brain is formed by what is known as the cortical portion or grey matter, which is folded upon itself in a number of elevations and depressions called convolutions and involutions.

This grey matter is the dynamic or active part of the brain, and is supported by the white matter to the outer surface of which its convolutions and involutions are accurately moulded. It is the object of the convolutions and involutions to increase the amount of surface for the development of the grey matter, and, from a very large number of observations which have been made, it may be considered as proved that the size and depth of the convolutions and involutions is proportional to the number of foot pounds moved by the individual during early life.

The brains of the cetacean are found to be quite highly convoluted, and when the extraordinary rapidity and energy with which they can move their large and bulky bodies through so resisting a medium as sea-water is borne in mind, it will be seen that they must overcome

the equivalent of a considerable number of foot pounds in the ordinary course of their lives.

While, upon the other hand, the brain of the cat presents rather poorly developed convolutions, for the cat, although an exceedingly active animal, has yet so slight and small a body that the sum total of resistance in foot pounds overcome cannot be great.

Herrick says: "A more highly convoluted cortical pattern is found in large animals than in smaller ones of closely related species."

It is, therefore, evident that the convolutions alone are not necessarily in themselves the source of psychic capacity. It can also be shown that the absolute size of the brain does not necessarily bear any direct relationship to the intellectual capacity of the individual.

The largest brain that I am aware of is recorded by Dr. Morris. It was taken from a Sussex bricklayer, who died of pyæmia in a London hospital. He was 5 ft. 9 in. in height, of robust frame, and his brain weighed 67 oz.

Herrick says: "The average weight of the normal adult European male brain is commonly stated to be 1,360 grammes (48 oz.)."

He could neither read nor write, and was never in any way remarkable for intelligence, although his wife said he took an interest in politics!

Dr. Bucknill mentions the case of a male

epileptic whose brain weighed 64·5 oz., and Dr. Skae gives the case of a woman who was a monomaniac with vanity, whose brain weight was 61·5 oz.

It will be seen, therefore, that the intellectual capacity of the individual is not necessarily proportionate to either the size of the brain or the quantity of grey matter, but just as a large field, if properly cultivated, might be expected to produce a bigger crop than a smaller field under similar circumstances, so it is our duty in dealing with the child in early life to take such steps as may reasonably be expected to increase the quantity of grey matter.

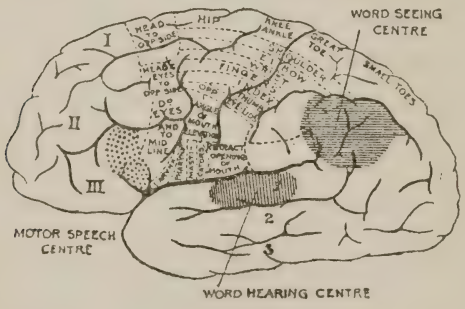

PLATE 38.

Plate 38 shows the regions of the brain which are directly in relationship to various parts of the body, and active movements of these parts in early life stimulate the growth and development of the cortex in the corresponding centres of the brain. In cases

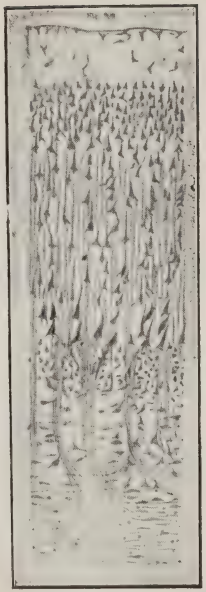

PLATE 40.—MAGNIFIED SECTION OF GREY MATTER.

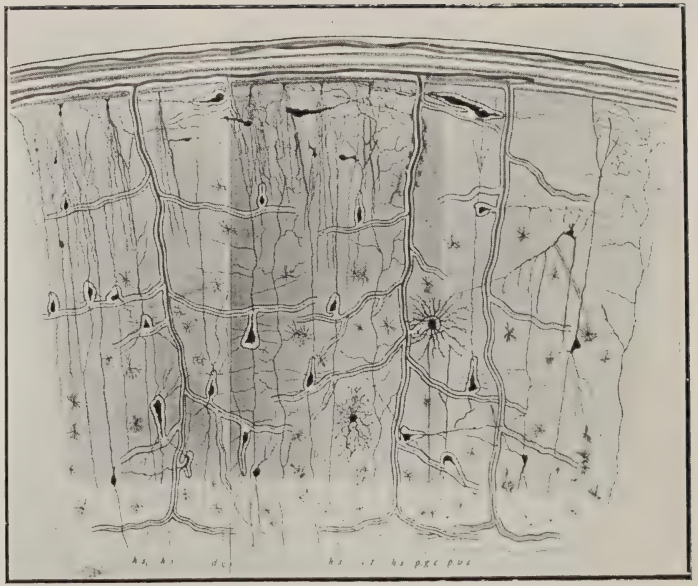

PLATE 41.—SECTION OF GREY MATTER WITH MENINGEAL MEMBRANES, PERI-VASCULAR SPACES, ETC., DIAGRAMMATIC, FROM TUKE'S WORK.

where, from injury or disease, some portion of the body or limbs has been undeveloped or lost in embryonic or very early life, and subsequent opportunity of post-mortem examination has been obtained, complete arrest of development was found in the corresponding centres of the brain.

It is manifestly our duty, therefore, to encourage the most varied and active exercises of every part of the body and limbs, *within the limits of nutrition*, during that period of life when growth and development are most energetic.

Plate 39 shows a section of a couple of convolutions separated out from the rest of the brain, and it will be seen that the grey matter is divisible into definite layers varying in number from three to seven, according to the portion of the brain examined. This cortical or grey matter is more abundant to the extent of some 7 per cent. on the left side of the brain than on the right, which is attributed to the undue precedence too frequently given to the use of the right hand (Quain).

Plate 40 is a magnified section through the grey matter showing the grouping of cells in the different layers. These cells have been estimated at over 9,200,000,000 in an ordinary average brain.

In the third layer there are a great number of large pyramidal-shaped cells, to which have been given the name of psychomotor cells, and

it is with these that we are more immediately concerned.

Plate 41. This illustration is taken from the work of Tuke. It shows the blood-vessels descending from the arachnoid membrane on the surface of the brain into the substance of the grey matter. You will observe that these little vessels lie in canals or spaces which are known as the peri-vascular spaces, filled with a watery fluid which surrounds the vessels, and is in communication with the great body of the cerebro-spinal fluid, the whole acting as a water-cushion for the brain and spinal cord. The quantity of this fluid in these spaces is inversely as the quantity of blood in the vessels, so that when there is but a little blood in the vessels there is more fluid in the spaces, and thus the brain and cord are maintained at an equal pressure within the cavity of the skull and spinal column. If the arteries were in direct contact with the brain substance they could not contract or dilate without causing more or less injury to this very delicately organised structure, but this beautiful provision allows of great variation in the blood currents without any injury whatever.

You will observe that the large pyramidal cells lie in cul-de-sacs or cavities opening off the peri-vascular spaces. In cases of inflammation or prolonged hyperæmia from overwork, where excessive proliferation of the endo-

thelium has taken place, these cells have been demonstrated to be actually crushed by the blocking up of the cul-de-sacs from the accumulation of broken-down epithelium. When an impulse or stimulus is conveyed to a group of cells they become slightly swollen, a biochemical change is initiated which reacts upon the perivascular fluid, which in its turn stimulates the local blood supply, producing a more or less active hyperæmia of the part stimulated, but if the stimulation be maintained too long, the products of degeneration of the nerve tissue resulting from its activity accumulate and become positively poisonous, producing restlessness and excitement. Mosso has shown that the injection of fluid containing the products of fatigue into a healthy animal has produced fever and even death.

Plate 42 traces the development of the pyramidal cell in the human species and in animals. In the first place we observe that in the early stage of the embryo the cell is somewhat oval in shape, presenting, as it were, a stalk or stem, which conveys the impressions of the stimuli from the surface. We then observe that as the stimuli are repeated the cells begin to throw out processes in the effort to establish communication or association with other groups of cells, and that as development progresses these branches become more numerous and complicated and that finally the branches

present little projections which are known as gemmules or buds. It will be seen that a similar increase of complexity can be traced in the development of these cells in the frog, the newt, the mouse, and the human subject. It

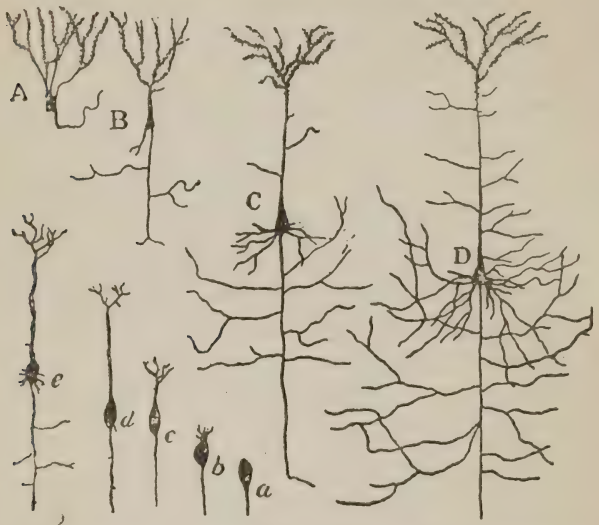

Diagram after Ramón y Cajal to show the autogenetic and phylogenetic development of a psychomotor neurone. A, frog; B, newt; C, mouse; D, man It will be noticed that as we rise in the zoological series there is an increase in the complexity of the neurone and in the multitude of points of contact, produced by an increase in the dendrons and side branches of the axon; *a*, *b*, *c*, *d*, *e* show ontogenetic development of a psychomotor cell in the human embryo.

PLATE 42.

must not be supposed that this is necessarily an argument in support of Darwin's theory of evolution. The fact that a unity of type is adopted where a unity of function is aimed at, and that increasing complexity of type is asso-

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PLATE 43.—PYRAMIDAL CELLS MORE HIGHLY MAGNIFIED, SHOWING NUCLEUS AND NUCLEOLI, BODIES OF NISSEL, ETC.

ciated with increasing complexity of function does not necessarily suggest that C is derived from B, or B from A, but much more forcibly that they are all derived from the same source.

Plate 43 presents for examination the bodies of a number of these pyramidal cells more highly magnified. It will be seen that they possess nucleus and nucleoli, and that there are a number of small oval dark bodies scattered throughout the cell. These are known as the bodies of Nissel and represent the nutritive condition of the cell. Chemical analysis has shown that these bodies of Nissel are rich in phosphorus and iron. It will be, therefore, necessary that the food of the child should contain a reasonable supply of these ingredients. There is also a trabecular structure ramifying through the cell.

The cell in the centre of the picture represents one in full vigour, the nucleoli are clear and well marked, while the bodies of Nissel have taken their staining distinctly, and you will see that the body of the cell is giving off a number of branches. Degenerative processes in various stages are shown in the remaining cells on this plate.

Plate 44 shows a pyramidal cell in more detail, the dendrites or branches, with the little buds or gemmules upon them ; also the afferent branch or axon which conveys the impulses or stimuli from the periphery. It is long and

straight, giving off branches at right angles which are known as the collaterals of the axon. Two of these collaterals can be seen to reach out in close proximity to the dendrites detached from the body of another cell. These collaterals

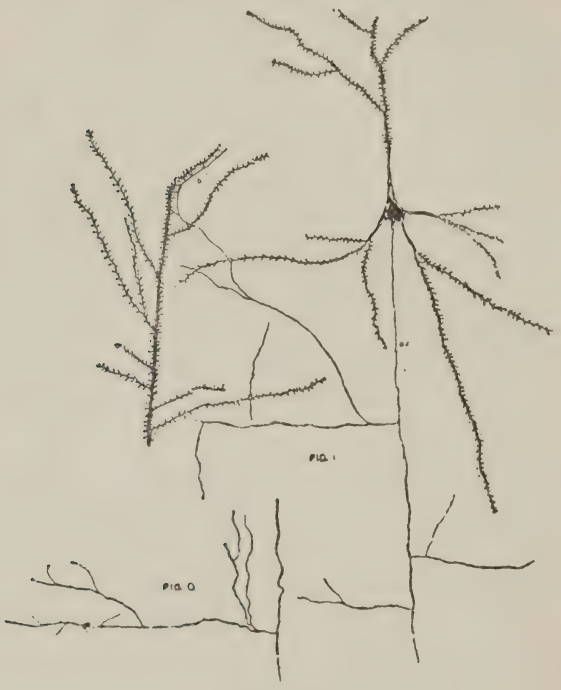

PLATE 44.

come very close to the gemmules on the dendrites, but direct communication has not as yet been demonstrated between them.

Plate 45. We have here a well-developed pyramidal cell showing dendrites and gemmules

and axon with collaterals. Placed in contrast beside it we have a withered cell, from which

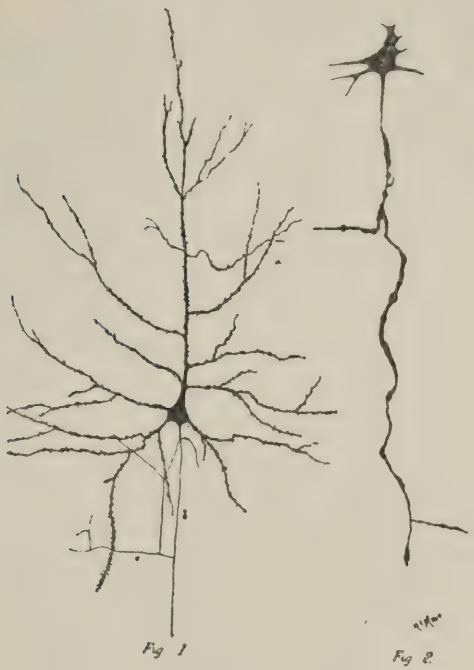

PLATE 45.

most of the dendrites and all the gemmules have disappeared.

Plate 46 shows groups of pyramidal cells in various stages of degeneration. It will be seen that in most cases the branches have almost entirely disappeared, and that the bodies of Nissel are only represented by some fine granular matter. On the right-hand side of

the lower part of Plate 47, the cell of rounded appearance without any branches whatever was taken from a patient who died of general paralysis of the insane.

We are justified, therefore, in concluding that the vigour of an individual, physical or mental, is principally due to the state of growth and energy of the pyramidal cells in the grey matter. These cells, to be fully developed, should present from fifteen to twenty branches or dendrites studded with several hundred gemmules, and the axon should give off a number of collaterals to establish communications with the dendrites of the neighbouring cells, by which means the various nerve-centres are enabled to test and correct impressions received through the different sensory organs. To make more clear what I mean, perhaps I may be allowed to take an illustration.

If from this plate of fruit I select a specimen and ask you what I hold in my hand, you will say a pear; but if I strike it upon the desk, you will say that it is not the sound you would expect a pear to give. If you smell it, it does not smell like a pear; if you grasp it, it seems lighter and softer than a pear. You will, therefore, come to the conclusion it is not a pear at all, and in this you will be correct. It is only a pin-cushion made to resemble a pear.

It will be plain, therefore, that we fell into error by being in the first place prejudiced by

PLATE 46.—DEGENERATED PYRAMIDAL CELLS.

PLATE 47.—DEGENERATED PYRAMIDAL CELLS.
(No. 4 taken from case of General Paralysis.)

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environment, and in the second by giving undue value to the factors of colour, size and shape, but when we call into play the corrective powers of the other nerve-centres by which we appreciate the remaining factors of touch, weight, sound and smell in due proportion, we see that our first estimate is incorrect, and as the resultant of all these observations, we conclude that this is not a pear at all, and in this we are right.

Matthew Arnold shows that he appreciates the necessity for this combination of different mental powers in the production of sound judgment when he says that Joubert " has the faculty of judging with all the powers of his mind and soul at work together in due combination, and how rare is this faculty."

Physical activity in early life tends to the growth of the whole mass of the brain and spinal cord, and thereby provides a larger field for the development of the grey matter in which these psychomotor cells subsequently become elaborated, but it must be borne in mind, and cannot, perhaps, be too frequently repeated, that stimuli, to produce growth and development, must always be kept within the limits of nutrition. When the stimuli are continued beyond these limits, atrophic changes are initiated, the products of fatigue begin to accumulate, and the first step is taken towards degeneration and death, and is probably never

retrieved. If we define training as the application of duly regulated stimuli to given groups of nerve-centres within the limits of nutrition, it will prove a useful working definition ; if we bear in mind that the associations and communications between the different groups of nerve cells, as long as we are within these limits, cause the growth and development of the dendrites, gemmules and collaterals, we will be able to define the educational value of an idea as commensurate with its capacity for association and suggestion. This is the scientific explanation of the valuable help derived from the use of mnemonics.

Miss Emily Wilson, in *An Experiment on Synthetic Education*, says it is easier to learn at the same time two subjects that have living relationships with one another, than to learn one subject which is an isolated fact, having no vital relationship with anything else. (Education on the Dalton Plan.)

It can be shown that the function of the nucleus is to recuperate or restore the cell during periods of rest, but in those cases where undue demand on the functions of the cell has been made, the nucleus is obliged to surrender its reserve to meet the excessive strain, and when once atrophic changes have encroached upon this reserve recuperation is no longer possible. In fact, the nucleus may be considered to represent the capital account of the energy of

the cell, while the bodies of Nissel represent the current account, and it can be demonstrated that if 40 per cent. of these psychomotor cells degenerate the individual passes into the condition known as dementia.

Only those who have given special study to the subject can form any idea of how easy it is to disturb the delicate mechanism of the neuron, more especially during the period of development. Professor Henschen tells us that even an unkind word has a damaging effect, and Dr. Montessori would not correct a child when it has made a mistake, lest the depression should cause degenerative changes. She prefers to pass over the mistake and wait for an opportunity of showing the correct method; she seems all through to think it better to demonstrate, rather than to tell the children what to do and how to do it.

We are indebted to Golgi for his method of demonstrating the structure of the neurons with their dendrites, gemmules and collaterals, which are almost entirely absent in the brain of the infant at birth, and can be observed to become more complicated as we ascend in the animal series, and that every current of molecular activity from one to another part of the brain leaves behind it some after-effect which renders its reproduction an easier matter.

Let an excitation take place in one or two

nerve cells lying side by side and between which there was not previously any specific difference, and ever afterwards there will be a difference between them. This physiological process is the physical basis of memory and habit and is the foundation of the development of all our mental functions. Not only definite ideas, but all affections of the nervous system—feelings of pleasure and pain, desires, etc.—leave behind them their structural effects, and lay the foundation (physically) of modes of thought, feeling and action. The impalpable thoughts thus leave their mark upon the brain and set up connections between the cells involved, so that the cerebrum grows to the uses to which it is earliest and most constantly accustomed.

Sherrington says :

" Each reaction that employs a neural path seems to smooth it by sheer act of travel. This is true even of slight impulses—light traffic—and more true of heavy."

When a child is born, very few of the fibres of its nervous system are myelinated or ensheathed, and we have now an anatomical explanation of the reason why an infant has so inactive a brain, and is so helpless a creature.

Flechsig has also shown that the sensory paths myelinate before the motor tracts; that the paths of transmission of touch and the other impulses connected by the dorsal roots

of the spinal nerves are the first to become completely formed, whilst the fibres for auditory impulses are the last.

The brain cells in a child are largely apolar or non-branching. The branches stretching from cell to cell are formed by the repetition of the same sensations or actions or thoughts, between the cells engaged.

The branches or dendrites rapidly increase as development progresses, till these attain their maximum in the adult human brain.

Experts tell us that in the great number of brains of which examination has been recorded, there have always been found some cells unbranched, showing that the limits of development have never yet been attained.

Sir J. C. Browne, in his *Book of Health,* says :

"The education of the senses will not be neglected if children are only placed in positions in which abundant and varied sense impressions are accessible. Vivid and complete impressions are all essential to subsequent mental growth."

The products of fatigue are at all times most injurious, but especially so during early life.

There is a marked decrease in the nerve cell nucleus after stimulation or fatigue, a change from a smooth and rounded, to a jagged and irregular outline, a loss of the open reticulated appearance, with a tendency to take on darker stains than the nucleus of the resting cell ; in cell protoplasm there is a slight shrinking in

size with vacuolation in the cell of the spinal ganglia, and in the cerebral cells a considerable shrinkage with enlargement of the pericellular lymph space, and decreased power of taking on stains. The loss of bulk consequent on fatigue in birds and bees varies from 9 to 75 per cent.

Seed planted in exhausted soil cannot be expected to germinate with vigour and beauty, and the impressions forced upon the worn-out neurons cannot be expected to produce those suggestions and associations with other neurons by which alone an idea can expand and become progressive, hence we frequently observe that men who have exhausted their nerve-centres toiling for numerous examinations can recite fluently the ideas of other men, but fail completely to see the bearing of these ideas even in their most evident relationship to the simple affairs of daily life.

It is useless to be able to reproduce the idea of a man who lived a hundred years ago, unless it can be made to bear effectually upon the problem of the hour, and bring about a combination which will enable one to operate more efficiently in accomplishing the end in view.

We have defined training as the application of duly regulated stimuli or impulses to given groups of nerve-centres within the limits of nutrition, and the skill and ultimate success of the trainer will depend upon his capacity to

appreciate what may be the due regulation of the stimuli and the limits of nutrition, in each individual case which is entrusted to his care.

From the foregoing considerations we believe that the following conclusions may be arrived at :

1st. That during the period of growth we may reasonably hope not only to increase these paths of intercommunication by constantly varying the stimuli, but also to increase the size of the neurons in every respect ; *provided always we keep well within the limits of nutrition.*

2nd. That, on the other hand, by maintaining the continuance of any one form of stimulus beyond these limits, we must, in the effort to keep up the communication in one direction, produce atrophy in other directions, bringing about an ill-balanced condition of these processes of communication which subsequently can only result in a disturbance of mental operations leading to more or less permanent distortion of judgment, or to interference with the capacity to carry out those delicate co-ordinations which are frequently necessary for the adaptation of means to definite ends. For it must be borne in mind that the integrity of these complicated functions depends upon the rapidity and ease with which impulses, whether sensory, motor, or psychic, can be transformed and become interchangeable : and that hence it is distinctly our duty, in dealing

with early life, to present a pleasing variety of interesting objects to the senses of the child, and that these objects should be as much as possible related to each other in a regular sequence, so as to establish the habit of association and stimulate enquiry in those cases where there is any gap in piecing together the details of the completed whole.

Herrick considers fatigue of the neuron under two headings, " Excitation " and " Depression." 1st. Excitation which is brought about by consumption of reserve more rapidly than it can be restored. 2nd. Depression by the accumulation of waste products more rapidly than they can be removed ; further, that the first signs of fatigue result from loss of oxygen, while Tashiro shows that during activity twice as much CO_2 is eliminated as during rest. We see, therefore, that the extreme importance of an ample supply of oxygen in childhood cannot be too strongly urged.

The results obtained by Dr. Willock in cases of anoxæmic atrophy, by supplying oxygen-enriched air to infants placed in an enclosed cot, are encouraging in this connection. *British Medical Journal,* April 15, 1925.

The metabolic capacity of the individual is the measure of his possibility of efficiency. Metabolism is sometimes defined as the biochemical change taking place in the neuron and its immediate environment, but is used here and

throughout these lectures in its broadest sense as comprising, not only this biochemical exchange, but also the supply of nutrition and the removal of the products of fatigue or injury, which are carried out by the accessory part of the nervous system known as the vasomotor, and a multitude of glands under its control, all or any of which are just as vulnerable as the psychomotor cells themselves, the whole constituting a commonwealth in which circles, sometimes spoken of as benign or vicious, are constantly arising, which exercise an ever-expanding influence from the centre to the periphery like the wavelets on a pond when a stone has been dropped into still water.

All life depends upon those processes by which the forces of environment are converted into the forces stored in or discharged by the tissues of the living organism, and, from this point of view, man is probably the most wonderful force transformer in creation.

We have seen that in the animal kingdom the most active agent in this metabolism is that part of the nervous system known as the vasomotor, and the activity of this vasomotor system depends very largely not only upon food and air, but also upon the constant variation of environmental stimuli.

The unpleasantness of what is known as monotony is largely due to overtaxing the capacity of the eliminating organs when the

accumulation of products of fatigue become excessive from unduly prolonged stimulation of an unvaried nature, and this gives us a key to the remarkable results obtained by Taylor of Bethlem, U.S.A. Observing that after about $1\frac{1}{2}$ hours' continuous effort, work was done more inaccurately and slowly, he suspended the work after a period of $1\frac{1}{4}$ hours, introducing periods of 10 minutes' rest, and found that 35 girls selecting steel balls for ball-bearings, did as much work, and did it better, in $8\frac{1}{2}$ hours, than 120 girls working $10\frac{1}{2}$ hours, before the introduction of the rest periods. One hundred and forty men shovelling sand, after the introduction of rest periods, did the work of 600 men previously. The weight on the shovel varied from 2 to 20 kilos, but the best results were obtained when half the maximum load was taken on the shovel. Men who loaded $12\frac{1}{2}$ tons of pig-iron in a day could now load 47 tons, and those who loaded 16 tons could do 59 tons.

Reaction delayed after $1\frac{1}{2}$ hours' work, means that the nutrition metabolism of the neuron was failing from accumulation of products of fatigue, and insufficient supply of nourishment. There was a remarkable proportionate increase of the earnings of the individual and reduction of the cost to the employer.

See F. W. Taylor's works, *The Principles of Scientific Management, Shop Management, Piece Rate System.*

CHAPTER IX

COMMITTEES OR BOARDS OF EDUCATIONAL CONTROL

"The disciple is not above his master . . . neither he that is sent greater than he that sent him."

IMPORTANCE of efficiency, groups of factors contributory or obstructive thereto. Responsibility upon the educational authorities to exercise some selective control in respect of the antecedents of candidates offering themselves as teachers.

The subject for our consideration in the present chapter will be Committees or Boards of Educational Control.

It will, I think, be granted that one of the principal objects of our existence is to be able to master efficiently and bring to a successful issue the varied problems of daily life with which we are required to deal; and this is more especially difficult in those occupations which demand a many-sided development of character, and which are constantly under the scrutiny and criticism of the public.

To bring about this efficiency we have to look to two groups of factors:

1. Those which we inherit.
2. Those which we acquire by education.

As inherited conditions, although they may admit of modification, cannot be removed we will only delay to point out the importance of endeavouring to take such measures as we may reasonably hope will prevent, or at all events discourage, those most likely to prove unsuitable in this respect from passing the portals of the Teaching Profession.

With this object a form something similar to that for a Life Insurance, with special reference to family history, might be required to be filled in by the candidates presenting themselves for the Entrance Examination, as important light would in this way be thrown upon the constitutional tendencies of the individual, and if a system were established of awarding marks in accordance with the information obtained, and these marks included in the grand total necessary to secure a pass, we could certainly exercise some control over the selection of what we may be allowed to call the raw material.

It is scarcely possible to conceive anything more unfortunate, either for the individual or the community, than that one whose antecedents have a pronounced tendency to lunacy or epilepsy should undertake the arduous, responsible and often disappointing duties of a teacher's life, where above all things self-control, patience and endurance are most urgently necessary, and where lack of these

qualities can only result in misfortune to the public and discredit to the profession.

Many who have this tendency to insanity are in youth remarkable for great mental activity, and are able to pass examinations with distinction and easily obtain all necessary qualifications; but only too many medical men have seen otherwise promising lives ruined by the depression, disappointment and anxiety of an active teacher's life, when, if they had pursued a less harassing and responsible career, they might have proved valuable citizens of the world for at all events a much longer period, or possibly for the whole of their natural lives. But terrible as is such a calamity to the individual, that after the expenditure of much labour, money and time, he or she should not only be set aside from active participation in daily life, but become an encumbrance to the resources of the community, and blight the hopes of fond relatives, yet it is as nothing to the injury done to society, while the true nature of the malady is as yet unrecognised, and the unfortunate sufferer is still wielding with terrible effect all the potentialities of this most influential position.

It would therefore appear that in view of the grave responsibilities, that must of necessity devolve upon those who would stand in this relationship to the public, and of the exhausting and anxious nature of such responsibilities, it

becomes a duty that some such step as that above suggested should be adopted by the educational authorities for the protection of childhood, and for the honour of that vast body of earnest workers which the aspiring candidate hopes to adorn.

Of course there should also be a physical medical examination, specifying height, weight, chest measurement, condition of sight, hearing, teeth, lungs, heart, etc., and any other particulars that the medical examiner would think desirable. These investigations proving satisfactory the candidate is now eligible for admission to the Entrance Examination.

The second group of factors, viz. those derived from education, being more within our control, will have to be entered into in greater detail.

Teacher-Training

It is perhaps scarcely too much to say that the teacher must be looked upon as the mainspring of the whole mechanism, and that the part played by the committee or board or whatever authorities are responsible for the training of the teacher, may be compared to the manufacturer of the mainspring of a watch, and here we may take up our parable and say: "The disciple is not above his master . . . neither he that is sent greater than he that sent him." For surely if the mainspring be defective

or break down, no matter how elaborate the rest of the works may be, the watch is either a source of constant trouble or absolutely useless, and if the conception of the aim and object of education is not quite distinct and clearly defined in the minds of those in whose hands lie the making of the teachers, how can it possibly be expected that the teachers themselves should be found efficient and satisfactory?

In the opinion of the writer, the whole scheme of education in these countries, and perhaps, to a certain degree in some other countries, has broken down principally from failure to grasp that man is a physiological being, and that as such his physical development is the first, and, in early life, the most important factor to be considered, that his mental and moral characteristics can only be brought into harmony with his environment through the normal development of his physical machinery, and the moment any portion of this machinery becomes pathological a disturbance of relationship to environment is brought about, the tendency of which is to establish a vicious circle producing a reciprocity that will be continually on the increase and make it hourly more difficult for the individual to resume harmonious reaction.

Now as destructive criticism should always be the most active stimulus to constructive efforts, we will endeavour to briefly review

what we believe to be some of the most serious difficulties that hinder the educational development of those qualities in the teacher which tend to make his or her life not only useful and happy, but will leave lasting effects behind to the benefit of generations yet to come. Therefore those upon whom lies the onus of drawing up regulations for the training and subsequent life of the teacher should realise the serious nature of their position, and, recognising that the methods hitherto followed have fallen very far short of what could be desired, will look more thoroughly into the matter, and seek information from every source, at home and abroad, to put the whole question on a sound footing from a physiological, psychological, sociological and economic point of view, when it will be found that these sciences all work in harmony, each supporting the other in its proper place, and that it is the neglect, or disturbance, of any one which throws the others out, and must inevitably end in disappointment and failure. This will be no easy task, and cannot be disposed of in a couple of hours once or twice a week, in a committee or board-room, where many of the members are thinking about other things, and are looking at their watches, or the clock, to see how soon they can get away to more remunerative work, or some entertaining amusement.

What we want is whole-time men, whose

minds are trained to patient scientific investigation, and who are willing to spend and be spent for the work they have taken in hand, who have no political or party axe to grind, who are not seeking popularity with the Government, the teacher, or the voter at the next election, but who feel and know that they are active units in a great cosmos, and as such can be a blessing, or a curse, to multitudes of their fellow-creatures, causing by their decisions, it may be, endless suffering to the innocent and helpless, or crowning the whole nation with life and joy; winning the blessing of thankful hearts, and demonstrating to the world what man can be, if he will only cherish instead of blighting the wonderful gifts of the great Creator.

On examining the personnel of many of these boards or committees, one cannot but be struck by the absence of the scientific element. We find the names of the most estimable and influential people who are, no doubt, anxious to deal with the situation in the best possible manner, but who from absence of special training frequently fail to recognise its most obvious requirements.

"In 1855 Faraday, who modestly described himself as 'not an educated man,' affirmed, in presence of Prince Albert and a large assembly of highly cultivated and socially notable persons, his clear conviction that the most highly educated minds in this country were often

entirely undisciplined in the merest elements of the knowledge of things, as opposed to words and abstract ideas, and that these minds, even in mature age, remained impermeable to truths which, to one with any scientific discipline at all, were all but axiomatic.

"Faraday was not only assured by his own experience as a teacher, that very young minds were open to receive, and ready in apprehending, the data and inferences resulting from well-conducted experiments, but he had also had before him the fact that in the most highly cultivated classes in English society, persons were to be found on whom experimental and physical evidence failed to make any impression at all, when brought into contact with an *a priori* conviction, however foolish and absurd. The crude impostures of table-turning, spirit-rapping, and other quasi-supernatural manifestations were at this period in full flow of their fashionable popularity, and Faraday, who was withal a man of the most sincere and profound religious faith, maintained without hesitation that these materialistic communications, alleged to be from the spirit world, were as such wholly unreal and misleading. As regards some of them, he proved to demonstration, by physical experiments of a remarkably simple kind, that this was so. But still the great world, and the fashionable world of society, went on believing and furnishing converts to wholly exploded fallacies. Faraday was thus led to the conviction that there was a grave deficiency in the scholastic discipline of very high-born and distinguished Englishmen

in his day ; and in 1862 he obtained the opportunity of explaining and impressing this opinion more at large before the Public Schools Commission of that date."

More recently Huxley also spoke very strongly upon the lack of capacity to observe and make correct deductions from even the most obvious scientific data which he found pervading the whole system of education in his day, and again in our own time Horsfall has written in the same strain. See development of neurons, pages 115 and 117.

Now we must bear in mind that the adverse critic is always unpopular and that these men had nothing to gain, but a great deal to lose, by the honesty and vigour of their denunciation of the prevailing methods, which were certainly countenanced, and even approved of, by the influential people, whose patronage could not fail to be a powerful aid in what is commonly accepted as success in life. In all fair-mindedness, therefore, we should feel grateful to these brave men and not only give them a patient hearing, but analyse in as unprejudiced a manner as possible, each step in their line of argument before we reject the conclusions which may be so distasteful, but perhaps useful in benefiting our people.

In a newspaper report some time back an American Ambassador is stated to have said at Cambridge, that he had been very much

struck by the fact that in England there was always one great reason for doing a thing, and another great reason for not doing it. "The one great reason for doing a thing was that it had always been done, and the one unanswerable reason for not doing it was that it never had been done."

Dr. F. H. Hayward, at a lecture to the Child Study Society, is reported to have said that, although there is abundance of cleverness the amount of intelligence is very small. Defining intelligence as "Sensitiveness to the facts and problems of existence, and some ability to interpret and solve them," the lecturer asked, "Are our statesmen intelligent in this sense?"

"If you have any vital problem to propose, go to your public men, and nine out of ten will not understand it; they have not enough intelligence.

"The educational remedy proposed is to reach the pupils' hearts, to teach them love of truth, beauty, goodness and efficiency."

I am afraid it is only too evident that to carry conviction to our people, most of whom have already passed through the furnace of our academical institutions, will be very difficult, for there is unhappily no reason to believe that the public mentality of to-day is anything better than that of the "highly cultivated and socially notable persons" of Faraday's time, "entirely undisciplined in the knowledge of

things as opposed to words and abstract ideas, and whose minds, even in mature age, remained impermeable to truths, which to one with any scientific discipline at all were all but axiomatic." But there is good reason to believe that the natural intelligence of the young child in these countries is not on a lower level than that of other countries, which we see making such wonderful strides not only in the acquisition, but in the practical application of knowledge, and, in fact, many of us are rather disposed on the contrary to expect that, other things being equal, the British child should do better, living on his Atlantic washed islands, with all their invigorating gifts and possessing an inheritance from an ancestry which has been largely built up by a varied contribution from ancient nations, distinguished for their wonderful ability, not only in the arts, but also in the sciences and applied industries, of which we have indisputable evidences in our museums and in our historical traditions.

There are many other considerations in support of the above line of argument which we would like to bring forward, but fear that in spite of the importance of the subject we might become wearisome. We will, therefore, endeavour to group as briefly as possible what we believe to be some of the principal objections in this connection to the prevailing system and the remedies within the range of practical politics.

1st. That the teacher, as he or she at present exists, does not seem to grasp the true view, either of education or of the creature to be educated. He has not really been in the true sense taught to teach, he does not regard it as essential that knowledge, to bear fruit in wisdom, must first become part and parcel of the individual who possesses it, growing with his growth and increasing with his years; that the individual must be able to make himself the medium of so associating his knowledge with the circumstances with which he is contending as to bring harmony out of discord, and to establish effective relationship where hitherto antagonisms alone had existed.

2nd. That the tendency of modern times, both on the part of the teachers and the general public, has been to aim at the attainment to a superficial display of knowledge of facts, without making any true effort to establish the relationships or bearings of those facts, and that hence such knowledge must remain practically barren and useless.

3rd. That examinations occupy too prominent a place, not only in the training of the teacher, but also in the life of the child, and monopolise valuable time and opportunity which could be more profitably devoted to work calculated to develop the physical senses and to cultivate the mental capacity for synthesis and analysis.

4th. That the great aim of all those who

would desire really to be considered educators in the true sense should be to lay the foundation for an active and vigorous condition of physical, mental and moral well-being in the adult between the ages of twenty-five and seventy, and not to bring about a brilliant display of psychic precocity during the period which should be devoted to the growth of the tree and not to the collection of the fruit.

5th. That in consequence of the lack of sufficiently definite ideas upon the subject of true education, there has been a tendency to devote too much time to mere memory training, and that from the deplorable ignorance of the fundamental principles of physiology, the great fact that the work of the neurons in early life should be principally engaged in controlling the development of tissue, and *not* in the very exhausting and elaborate processes of psychic evolution, by which the organic development of the body, including that of the neurons themselves, is stunted instead of being fostered and encouraged.

6th. That the present system fails to cultivate the faculty of accurate observation and to develop the habit of making deductions therefrom.

Perhaps it may simplify the matter if here we group some of the essential points which we believe would place the constitution of the boards and committees upon a more hopeful footing.

If we clearly grasp the fundamental principles of our educational scheme, the adjustment of details to any varying circumstances that may arise can scarcely go wrong.

1st. In all committees or boards, there should be two or more whole-time men, whose business it would be to procure information from every possible source as to the methods adopted or eliminated in the educational practices of all countries in the civilised world.

2nd. Either in this specialised department, or in the larger body of the board, the medical, the architectural, the sanitary engineering and the teaching professions must be represented by men of good standing in their professions, who have had at least 10 years' practical experience.

3rd. The main body of the board should, no doubt, have representative clerical, legal, business men and others who are in the habit of weighing evidence and who would act as the jury to give the final decisions on the various points as placed before them by the experts.

While we are persuaded that it is only after many years' special training, the minds of even those who are more than ordinarily gifted can fully grasp the bearings of their specialised line of thought upon the daily life of the community at large, yet we feel keenly that even under these favourable circumstances, specialism has

a dangerous tendency towards narrow-mindedness and obstinacy, and that sometimes the broader view of the unprejudiced man in the street may be nearer to wisdom.

It will, we think, be concluded that a committee selected on these lines need not be very numerous, and that it will get through more work in a shorter space of time than several committees as at present constituted.

One of the great advantages of expert training is that, as a general rule, the mind of the individual will more quickly recognise the essential points of the case, and with experts, such as we have recommended, to extract from the current literature of the day all suggestions, whether destructive or constructive, and place them before the board at the meeting, or send them to each member a few days previously, to give time for more leisured consideration, much diffuse discussion and useless cross-questioning, causing loss of time and failure to obtain effective results, would certainly be avoided.

The following extract is from Sir George Newman's Report in the *British Medical Journal*, November 22, 1924:

"Notwithstanding his duty of advice to and criticism of local education authorities, he takes the opportunity of expressing to them his 'full sincere and growing appreciation of the competency and devotion of their service.'

"The present report, as he points out, is more administrative than usual, because though never before has there been so much enlightened and organised effort on behalf of child welfare, yet for the success of the mutual and joint labours of all who are engaged in the work, whether officially or voluntarily, good understanding and wise, patient and elastic administration are essential.

"There must be assent of the governed, adjustment of ways and means to ends, and due regard for the susceptibilities of the child and its parents, together with willingness to undertake new duties indicated by new conditions."

We are very pleased to make this quotation, for we wish it to be distinctly understood that while we must condemn the methods adopted we would like to express our highest appreciation of those, both committee men and teachers, who have shown much unselfish devotion in spite of the obstructive regulations by which many of their efforts are often frustrated.

Next, as to personal hygiene in the case of school-children, this is a matter mainly of education rather than of sanitation, and is, perhaps, the most important subject of the whole curriculum. Yet Sir George Newman declares :

"The plain fact remains that training colleges afford insufficient attention to this subject,

and many local education authorities devote less attention to it in the school than is given to any other prescribed subject of the official curriculum. The teaching of hygiene and the laws of health, by systematic instruction and by daily practice, should be undertaken in every school throughout England and Wales."

The preposterous absurdity of deluding ourselves with the idea that we are educating a child, while we leave him in his dirt and rags, does not seem to have struck the British people, although it has been for many years the first consideration all over Scandinavia and parts of Switzerland.

I saw in a recent newspaper that a clergyman in London stated that in his parish of 5,000 people there was only one bathroom.

CHAPTER X

TEACHERS AND THEIR TRAINING

"Give instruction to a wise man, and he will be yet wiser."

HAVING in our last briefly reviewed the constitution of the committees and boards, we will now direct our attention more especially to the teachers and their training.

No doubt the conditions of those offering themselves as teachers vary widely, but while the training should not destroy individuality, it should be directed to bring into prominence the qualities most calculated to foster in childhood those capacities which will bear fruit in after-life in good citizenship; but the knowledge of these capacities and how to develop them, necessitates a knowledge of the child, and of the circumstances and influences most favourable to their development, and it is just here that the grave responsibility of the authorities behind the teacher becomes so serious.

At this stage it may help us to pass in review two types of teachers taken from life, standing in marked contrast, but both, unfortunately, open to the objection pointed out by Sir Sydney

Russell Wells, " of a narrower outlook than one would wish our teachers to be."

Some time ago I had an interview with a man who would be considered an expert educationalist, that is, he had given many years to work in the schools, but had never been taught anything about the child, and, being a celibate, was precluded from the possibility of learning from children of his own, who might have expanded not only his sympathy but his mind, more in six months than all his books could do in the longest of lives. He had begun in the middle of his subject instead of at the beginning.

He came to ask me to subscribe to the institution to which he belonged. I was very busy at the time and felt tempted to give him some money and get rid of him, but this would not be honest, and as honesty is the essential principle of mutuality, it seemed my duty to set aside my other work and speak straight to him. I therefore said, " No, I cannot support your Institution, for I feel it my duty to protest against your methods ; you keep the children too long at their lessons."

He seemed annoyed and replied with vehemence that " six hours in school and six hours home study was not too much for any child."

He was a well-grown, lean man, bony and muscular, apparently about 55 years of age. Judging from his manner and address, I should

say that he grew up in the provinces remote from any of our large towns at a period when tea and coffee were little used. The food of his childhood would comprise bread made from home-grown wheat, and oats, ground in rough millstones, containing plenty of phosphates and lime salts, fish, eggs and vegetables; and the creameries not being in existence, both children and calves got something better than separated milk.

Most probably his schooling only averaged a few hours a day. His lungs were always well supplied with fresh breezes from the open country while working on his father's farm, and he could sleep undisturbed from dark till dawn in the silence of the peaceful country.

Such men often pass from their cradle to their grave without knowing what it is to suffer even from a headache, or to spend a single sleepless night, and if their mental and moral development were as sound as their physical, they would be just what the country needs.

They are well described as iron men, iron in body, will and brain, cast in a mould, narrow-minded and dogmatic in religion, austere and absolute in the exercise of authority, and although often well-intentioned, regard sympathy as effeminacy, prudence as cowardice, and argument as vacillation.

They may be well up in classics, and perhaps

mathematics also, but of the most essential part of all their work, that is the child, they know absolutely nothing.

Such men are sometimes preferred by unthinking people as masters or tutors, because of their supposed inflexibility, but we often see the inflexibility vanish very quickly in the presence of either self-interest or danger, and yet they are expected to cherish the development of the most delicate and intricate and also the most important of all the attributes of human life, and to evolve useful citizens out of the feeble offspring of the denizens of our slums.

Morning after morning his school will be filled with pale-faced stunted children, from wretched tenement rooms in dark dismal lanes and courts, where a bright ray of sunshine, or a fresh pure breeze of heaven never penetrates; where fighting and drunkenness and the foulest of language render peaceful sleep an impossibility. Where the diet will consist of stewed tea and white bread, to be varied occasionally by a little porter as a treat, and yet he requires this child to sit upon a form crouching over a desk in an ill-lighted and imperfectly ventilated schoolroom for six hours a day, to do six hours preparation at home, and to build a physique and brain capable of struggling with the vicissitudes and difficulties of life in the humbler classes of society.

Such hours would not be tolerated now, and even at the time of the interview were quite unusual; but it shows the type of mind which is only too often occupying a position of authority.

If this man had had even the most rudimentary physiological training, he could not have taken up so untenable a position.

Type 2. Our second example is that of a young girl.

Her father was a clerk in a city warehouse, who, when quite young, married the daughter of a clergyman who had killed himself working in a slum parish.

She was the eldest of a family of five, and worked hard, helping her mother to keep the house, and feed and clothe the children on £200 a year. The house was one of the neat, small, red-brick type, which seem to be always standing to attention along the quiet little streets that open off from the more busy thoroughfares of many large towns. One or two small stone steps give access to the hall-door by which you enter a narrow hall or passage where two people if at all stout can scarcely pass each other. There are five small rooms, and a small kitchen with a back-yard containing a wash-house, etc. The house is kept clean and orderly, but is limited in every respect, for the principal aim of the builder has been to get the greatest possible number of houses into the

smallest possible space, and when you place a family of seven within these limits, it is unnecessary to point out that there is not much latitude for freedom of movement, the development of muscular energy, or the expansion of either mind or body.

When a girl under these circumstances decides to become a teacher, and has to attend classes or lectures at some institution or college, she will have to help in the housework before leaving in the morning, and then, after a hurried breakfast of strong tea and bread and butter or margarine, will start for her classes or lectures, which may be a considerable distance off, through crowded thoroughfares. The sense of hurry and anxiety to reach her destination in time does away with whatever benefit she might otherwise derive from the exercise through the city streets in what is euphoniously called open-air. Her lectures and classes will last some hours, and what little lunch she may eat will be swallowed hastily while trying to think out her work or chatter with her colleagues. Finally, in the evening, exhausted and flustered, she will get home with her notebooks and papers most likely to find several odd jobs of domestic work to be done for the younger members of the family, or for the worn-out mother. She will very soon discover that a cup of strong tea pulls her together, and having got through the household difficulties will

retreat to the little parlour, where having lighted her lamp and collected her books, she will study till midnight or after it. Her sleep becomes disturbed and unrefreshing, and again in the morning she feels unable to do anything till she takes a cup of strong tea. In a little time she begins to suffer from repeated headache, which is increased by any prolonged effort at reading or sewing, especially by artificial light. Someone suggests that possibly her eyes are at fault, and she will lose the best part of a day awaiting her turn at one of the eye hospitals. Glasses are prescribed and have come to stay for the rest of her life. Now she finds that whatever little appetite for food she used to experience is gone, she never seems to care to eat, but is always anxious to drink; even the smell of food as she hurries past restaurants and hotels has become disagreeable or nauseating, and a few mouthfuls will make her feel filled up and uncomfortable. Still she goes on with extraordinary energy and declares that she never feels tired except in the morning. And now her hearing begins to give her trouble; in the noisy street she can hear pretty well, but in the quiet lecture room she has to be always on the strain to follow the lecturer. She passes her examinations creditably, and may at some period of her course go into residence at a training college.

Here things are a little better, she is relieved from having to take an active part in the continuous struggle of her home. She has no further trouble about what is to be provided for the next meal, all she has to do with it is to get it down as well as she can, when it comes before her, and to hurry to the next lecture or class. But, unfortunately, the food is often very indifferent in quality and not prepared in the most appetising manner.

These training colleges are sometimes situated in the midst of our densely populated cities, where free sunlight and fresh air are mostly conspicuous by their absence. The building is quite of the barrack type, the object again being to economise space, to herd together as many people as possible, and the damaging effects of long flights of stairs, hurry and anxiety, on the already over-acting hearts of young anæmic people, finds no more place in the deliberations of the board or committee, in authority, than the impossibility of deriving nourishment from food swallowed against time, while the whole energies of the nervous system are concentrated upon the terrors of an approaching examination.

At length this poor girl struggles through what is called her final, and is appointed to a school, her eyes damaged, her hearing impaired, her digestion a source of continual

discomfort and her nervous system exhausted. Bonar tells us,

"We must be true ourselves if we the truth would teach;
It takes the overflow of heart to give the mouth full speech."

Where is the possibility of this poor shaken enfeebled creature inspiring in her pupils that calm concentration which is the first essential for the acquisition of any sound knowledge?

How can her heart possibly overflow with that hope, cheerfulness, love and sympathy for the difficulties and troubles of her pupils, when her own sufferings and miseries dominate every moment? and how can her mouth have that full speech by which alone she could hope to explain away the perplexities, and clear up the obscurities of the poor little anæmic brains, which are compelled by State to remain grouped around her for so many weary hours every day?

The budding lives which are just beginning to unfold, if blighted by the harsh winds of irritability and censure, can only too easily bring forth the poison of criminality instead of the fruit of good citizenship.

The Rev. Canon C. F. Raven, D.D., Hon. Sec. C.O.P.E.C., speaking on Christian Citizenship, says that:

"for the Christian, knowledge was only one side and not the most important with which education could be concerned. No Christian

could feel happy if an educational system left out of account the education of the heart, the passions, and the instincts which filled a larger part in life than technical skill or intellectual subtlety."

It has been well said that the proper condition of a healthy organ is not to know that you possess it. The moment the individual becomes conscious of possessing a heart, a stomach, or a head, complete concentration on work is impossible with proportionate loss of efficiency. It should at all times be borne in mind that the perceptive faculties of childhood are particularly acute and that children, both consciously and unconsciously, are always imitating what they see and hear, and directly the teacher's attention wanders, the child will be similarly affected. Someone has said that capacity for concentration is the highest intellectual quality to which the human mind can attain, and even if we cannot go quite so far as to fully endorse this, yet we are agreed that without this capacity all intellectual and much physical effort will be useless.

It is true that the girl's early life will have taught her sympathy for the troubles and sufferings she has seen so much of in her own family, and that as long as she does not become irritable and fault-finding she will awaken love and respect in many a child's lonely heart, and exercise a great and lasting influence for

good, and even though she should fall an early victim to disease and death, she will not have lived in vain. But apart from the loss of money to the State and the disturbance of work, a useful life has been cut short, and much valuable energy misspent which, under better direction, should have been available for many years to help and guide the young and feeble.

On the other hand, the iron man can only inspire fear and hatred and scatter revolutionary savages broadcast over the world, to spread Bolshevism and degradation in their trail.

He was caught young and trained in a cruel school where hatred of all those who differed from him was supposed to be right, and where the possibility of love would be ridiculed as antiquated and absurd.

Unhappily these cold cruel teachers are not confined to the male sex. Women also are to be found whose only idea of maintaining authority is to terrorise and crush those who are in their power, especially if they are timid and unresisting.

People of this type are, unfortunately, so strongly fortified in their invincible ignorance, that it is quite hopeless to try to show them their errors. They are fully convinced that they are always right, and look with contempt upon those patient workers who still have faith in the existence of love and purity lingering amongst even the most degraded humanity.

On educating the poor, Miss Hogan, an American, in her interesting book, *A Study of a Child*, says: "There is an instinctive goodness and gladness in every child that, in spite of evil, heredity and depraved surroundings, will respond to sympathetic treatment."

Schofield, in his work on the "Unconscious Mind," has emphasised that the two most constant characteristics of the mind of the child are a "sense of justice and a capacity for affection." But justice, if repeatedly violated, engenders hatred which, if originated in childhood, grows with his growth until his hand is against every man, and as a natural consequence in time, every man's hand is against him.

Addressing the National Union of Teachers, Sir James Yoxall said:

"great strides had been made in the teaching of temperance, not by compulsory methods, to which he had always been opposed, but by that method of indirection which, though it sometimes appeared to be a long and slow one, was always the most educative in all great reforms to bring about a changed condition of things."

Alderman Conway, President of the N.U.T., said he

"agreed with Sir James Yoxall, in the belief that that inscrutable subconscious influence of example had a far more potent effect upon the children of our generation than any didactic method, adopted in the school, for over and

over again he had found that the personal influence of the teacher had resulted in the children reading for themselves the very things that their chairman had referred to."

We should now be in a position to address ourselves more to the constructive side of the question, and it appears that in making the teacher, the first essential is to attain to that reaction towards environment which will secure the fullest possible development of the functions of sight, hearing, feeling, smelling and last, but not least, the muscular poise and co-ordination which ensures that grace of movement and easy activity so attractive and charming to us all, but especially to the young ; or in more simple language, that sound health which will enable the teacher to so appreciate the ever-changing kaleidoscope of the children's physical and mental characteristics, as to bring about that adjustment by which the pupils may so master the particular task in hand, that the knowledge gained becomes part and parcel of themselves and bears fruit in wisdom.

Here I feel I cannot do better than quote some passages from a most admirable address delivered by the late Mr. Æ. J. Murray to the Dublin National Teachers' Literary and Debating Society, under the title "A Noble Calling," which is fully deserving of being treated in a separate chapter.

CHAPTER XI

TEACHERS AND THEIR TRAINING (*cont.*)

"A Noble Calling

"In selecting this theme I have had before my mind two objects. One to remind my fellow-labourers in the vineyard that the work to which we are devoting ourselves is not only one of the noblest and greatest in which man or woman can be engaged, but is, also, one for the proper fulfilment of which the highest qualities of heart and head are required.

"The second, to induce them to look within themselves, and to answer to the satisfaction of their own consciences, a few simple, but very important questions, such as: Have I entered into my present profession in life through a love of the office? Do I consider that I am specially adapted for it? Has my natural taste for training and caring for children been cultivated and directed by a study of the nature of the several duties which it involves? Do I love children and their ways to the extent that I am ever happy among them, sharing in their pleasures, delighting in their plays, sympathising with them in their troubles, and priding in their successes?

"Those of us who can reply to those questions in the affirmative can feel satisfied that we have not only chosen a profession which is suited to us, but we are conferring a boon—some will consider a blessing—on the communities to which we belong. . . .

"This point leads us at once to what possibly should have been in the natural order of things our first consideration, namely, the material upon which we have got to work.

"I hope I may be excused for using the word material in this sense. Surely no such material falls into the hands of any other craftsman to be shaped and adorned, so tender, so plastic, yet so varied in its composition, and then to consider that while all other works of man's hands are doomed to pass into nothingness—some earlier, some later—there is that within this creature which shall never pass away, but for eternity be a spirit of light and happiness, or a spirit of despair and darkness; and this often very largely influenced by the care and solicitude, the guidance and example shown in the schoolroom.

"The children of the more ignorant classes will be found, however, to require careful training and attention to cure them of wrong—not necessarily vicious—habits and to develop and nurture the good.

"The necessity for the further moral training and educating of the poor of our large cities may be brought home to us very forcibly by a passage from the Reports of the Philanthropic Society, published in the beginning of

the nineteenth century, in reference to the children of the poor in the London of those days. It says :

" 'Every child brought up in the resort of vicious and profligate people must almost inevitably imbibe the contagion of moral turpitude, and become an enemy to those laws, on which the general good depends. Lying is the first lesson of their tongues, and theft of their hands ; every object they see is at war with decency, and every impression they receive is a vice.'

" Such a picture, I hope, must be wholly untrue of any city or town in either Great Britain or Ireland at the present time. The schoolteachers have been abroad and have been doing their duty.

" Now, as the object of our work is to mould the child into a true and good man or woman, his or her nature must be understood by us, and a knowledge of the physical, mental and moral qualities of each child under our care ascertained to the best degree in our power. Nor is a knowledge of the home surroundings of a child less important for a due appreciation of those influences that to him may be advantageous or the reverse.

" It can scarcely be questioned that women possess in general more aptitude than men for child-training in its early stages ; and the confiding of children entirely in their charge is following the guidance of Nature. But though lady teachers, as a rule, are paid better in our elementary schools than they are in most of the high schools, it is, I think, to be

regretted that the drudgery of the elementary school, coupled with the fact that the elementary teacher does not get in society the position which she should hold, deters so many of the accomplished and refined of our middle-class girls from becoming elementary teachers.

"This, I consider, to be a great national loss, as the most lovable and tender natures should be obtained for the duties of the infant school. Maternal love is a magic power. It trains in the earliest and most difficult stages, and it should, as far as practicable, permeate the atmosphere of the infant school. Motherhood opens up the heart with love, not for its own alone, but for all children.

"The eye that has been trained to watch by the cradle of a sick child will detect much more quickly whether the dullness in the eyes of the little 'toddles' in the infant school is due to coming sickness or other physical weakness, and she, who has treated her own, will the more readily know and feel how to treat the little sufferer.

"Dr. Warner in his work, *The Study of Children*, mentions the case of a boy brought to him by his mother, because the teacher reported he was idle and troublesome and did not do his work. He, the doctor, examined him, and found the boy had a defective heart and an ill-developed brain.

"He says: 'Advice was given to the teacher that this boy should be kindly treated, and not expected to pass examinations,' and he continues, 'This boy had a right to the

benefits of education and his case is common enough.'

"And the doctor advises the teacher that observation and study of children as to their mental status will add power to the position of the teacher to be exercised for the benefit of the children.

"To be able to explain the mental condition of the child to its parent will give the parent confidence in the teacher and his school.

"Many, I regret, consider that these matters should not concern us teachers, that we are interested alone in the appearance of the Results Examination Roll. At times, too, no doubt, even those among us who feel our duties embrace a much wider field are carried away by this selfish feeling; but let us hope the evil of the system that has offered so much temptation may not have corrupted us so completely. There is surely something more to be thought of than the mere monetary recompense.

"One of our English High School masters, questioned on this Results payment craze, etc., replies, 'I consider my work to be the training of character, even more than of intellect, that morals have a greater bearing on life than knowledge.'

"Another of them replies, 'What we wish a boy to acquire at school is not so much a certain amount of knowledge as the orderly development of his faculties under good and trained teachers,' and Mr. Joseph Payne, in the same strain, says:

"'He (the child) has, moreover, a moral

nature capable by cultivation of becoming a means of usefulness and happiness to himself and others, or of becoming, by its corruption, the fruitful source of misery to himself and the community. It is the business of the educator by his action and influence on these forces to secure their beneficial and avert their injurious manifestations to convert this undisciplined energy into a fund of organised self-acting power. In order to do this efficiently, he ought to understand the nature of the phenomena he has to deal with, and his own training as a teacher ought especially to have this object in view.'

"Now, if this moral training of which the two High School masters wrote, be so necessary for the children of the upper classes, it cannot be questioned that it must be even more so for the children of the elementary schools, as it must be expected that the home training of the former should have been better than that of the latter.

"Opportunities for moral lessons will arise daily in large schools and classes, and every such opportunity should be turned to good account in the curbing or curing of an injurious habit or passion, and in the maturing of virtue.

"The incidents may be insignificant in themselves, and each require but little time to treat, but they will be found, in a few years, to sum up to a great deal for the good of the children.

"As showing the necessity for exertion in this regard, I am tempted to quote at some length

from the Baroness Bulow's book on *Child Nature.*

"'The characteristic features of our age are: knowledge without practice; thought precociously developed before fancy and feeling, like to bud and blossom, have matured the fruit; insight without power of action, the capacity for ruling matter degraded to the service of the material nature; no reverence for the all permeating spirit of God, no belief in the eternal working—human intellect regarded as the highest court of appeal. The childlike simplicity which surrenders itself to a higher and an invisible power is now almost unknown, for its source in the original unsullied nature in childhood, becomes early corrupted and education directs the mind only to outward things,' and again she writes, 'however much we may be justified in claiming for our own age great advance in all school and instructional arrangements, there is also no doubt that preceding generations excelled us in many respects with regard to education.'

"Children believe what they see, and expect the action to come up to the precept.

"Our personal intercourse with children cannot be so effective among the shifting population of large cities, as in villages and country districts, but this should not cause those of us so placed to abate in the least our exertions for the temporal good of the children entrusted to our charge. The beneficial results due to individual effort may not be so apparent, but the aggregate may amount to quite as much.

"We cannot contemplate the child without feeling what a serious business his or her training is. What care must be taken of every action and expression while in their presence. What self-control in every movement during the school day! How we must encourage and develop confidence and freedom of expression on their part, without familiarity or forwardness! Bright, eager eyes are ever scrutinising us, and if we fail in any part, an evil lesson is inculcated or an idol broken. What judgment is required in meting out praise or rewarding excellence—not to hurt the sensitive and the less gifted, who have failed to reach the mark, though quite as industrious as their more successful competitors, and not to injure the vain or naturally clever by over-praise, for as Mr. Ruskin truly says:

"'It is the effort that deserves the praise, not the successes; nor is it a question for any student, whether he is more clever than the other or duller, but whether he has done the best he could.'

"We can hardly say that we have yet got such a thing as a Science of Education, though, no doubt, a large amount of writing is being accumulated on school method, and the mental, physical and moral training of the young; but the application of this knowledge must be dependent on the ability and powers of perception of each individual teacher.

"The varied nature of the duties teachers have to perform, the perception of character, the control of self, the judgment, the patience, the firmness, omitting altogether the training

and book knowledge, sum up a collection of qualities that, to any ordinary mind, should at once justify him or her in seeking social position amongst the most respectable and gifted classes in the community. Yet the ghost of the poor, threadbare schoolmaster of darker days still frights away timid gentility.

"Most of our well-to-do people cannot understand that the upraising of the teacher is any part of their business. Many of them cannot appreciate the benefit of having children educated by a refined man or woman, as contrasted with a rude, ill-mannered one who taught an equal amount of arithmetic and geography in the same time.

"On this phase of my subject, Mr. Payne is rather eloquent referring to the English public. These are his words :

"'As well may you expect a blind man to take delight in pleasant sights, and a deaf man in pleasant sounds, as an uneducated public mind to appreciate culture. It does not know what you mean when you urge the claims of education as a civilising agent, and insist on the immense value to the Commonwealth of the accomplished teacher.'

"It may be assumed that the book knowledge, the special training in method of teaching, and the studies in religious knowledge, will be carefully attended to. These come into the crucibles of one or other class of examiner, and a critical testing follows; but more may legitimately be expected. These young people should be brought into contact with every

influence that could open their minds, cultivate their higher feelings, and refine their tastes, so that they, in their turn, may communicate some of the sweetness of this culture to their pupils.

"Could not half a dozen visits to museums, picture galleries, botanic gardens, etc., be arranged and conducted for them, under the guidance of capable, and, I need not say, enthusiastic artists or scientists; for all artists and scientists whom I have met were enthusiastic.

"If the nobility of the teacher's calling be acknowledged, and the authorities whom I have quoted strongly support the claim to that title, it then becomes necessary to see that this noble calling be nobly filled, that proper selections be made for the ranks, and the inducements held out sufficiently attractive to draw suitable candidates.

"Can it be imagined that we have arrived at the ultimate goal? Surely no! A long road lies before us, pointing to higher aims and loftier conceptions, to sublimer efforts. We have but humble, very humble places to fill. We are mere rankers; but we should, nevertheless, feel a true pride of place. We march in the vanguard of human progress.

"And now, my fellow-teachers, I shall, with your permission, call in the aid of the talented author of *The Day Dreams of a Schoolmaster*, to pronounce for me a final exhortation.

"'Oh, brother schoolmaster, remember evermore the exceeding dignity of your calling. It is not the holiest of callings, but it runs

near and parallel to the holiest. The lawyers' wits are sharpened and his moral sense not seldom blunted, by a life-long familiarity with ignorance, chicanery and crime.

"'The physician, in the exercise of a more beneficent craft, is saddened continually by the spectacle of human suffering and pain.

"'We have usually to deal with fresh and unpolluted natures. A noble calling—but a perilous. We are dressers in a moral and mental vineyard. We are under-shepherds of the Lord's little ones, and our business is to lead them into green pastures by the side of refreshing streams. Let us, into our lessons, introduce cunningly and imperceptibly all kinds of amusing stories—stories of the real kings of earth, that have reigned in secret, crownless and unsceptred, of the angels, that have walked the earth in the guise of holy men and holier women, of the seraph-singers, whose music will be echoing for ever.'"

We see, then, that the characteristics most required in the teacher can scarcely be better put than in the words of St. Paul, "Love, joy, peace, longsuffering, gentleness, goodness, faith, meekness, temperance," "Whatsoever things are true . . . honest . . . just . . . pure . . . lovely . . . of good report. If there be any virtue, and if there be any praise, think on these things."

"As a man thinketh, so is he." Here we have at once the summing up of the principal aim of the teacher's life, for if he or she can be

but the concrete expression of these qualities, they cannot fail to be not only a beacon to hail young lives into a harbour of refuge and safety, but also to show them a course to avoid the rocks and shoals of their daily dangers and temptations.

CHAPTER XII

TRAINING COLLEGES

"Teach a just man and he will increase in learning."

Our Training Colleges ought, no doubt, to enable the teacher at all events to attain to something of the high standard of perfection which we have endeavoured to depict. But unfortunately, hitherto, they have not risen to the occasion in the way that one could wish, and we, therefore, venture to suggest what we believe to be the lines along which a more satisfactory result might be obtained.

And first, the most important points in such an institution would be a healthy situation, a good outdoor and indoor gymnasium, a Slöjd room, a swimming bath, and if possible, an arrangement with some convenient school for lessons in riding.

I am fully aware that these suggestions, especially the latter, will be received with astonishment and perhaps ridicule, but I am also fully aware that even a short experience of dealing with animals and of the control of so fine an animal as the horse, will open up a completely new vista in the intelligence of many unfortunate city-reared people, which

will do much to expand, not only their minds, but their sympathies, as well as to exercise their muscles and to stimulate enquiry in completely new regions of thought.

Nothing should be left undone that may give a reasonable opportunity of overcoming that "narrowness" to which Sir Sydney Russell Wells has referred, and which has been, and still is, such an obstacle to the teachers themselves and to their pupils. He further expresses himself strongly as follows:

"Now if I wanted to sterilise the mind of anyone, and to narrow down his outlook, I should send him to a training college. Do not take me as referring to all who have been through training colleges. There are people of independent thought, of great ability, of robust character, who go through the training colleges without detriment. Nor am I branding every training college as necessarily bad; I am talking about what their effect is on the generality of people who go through them. They go into training colleges, where they receive what is called an education. They are separated out entirely and kept apart from everyone who is not going to be a teacher. It is a pure class institution. By 'class' I mean that they mix with nobody save those who are intending to become teachers. The character of the training is not in every case very high. Many of the colleges are little better than secondary schools, and the academic education given in many of them—again, I

do not want to generalise at all—really only supplements the defects of the secondary schools."

It would not be necessary that the teacher should, from the first, live in these colleges or institutions, but they ought certainly to spend a good many hours a day, and have at least one good meal, on the premises. Further, these students at certain stages of the curriculum should go through a course at children's hospitals and crèches, and attend lectures pointing out the characteristics which indicate constitutional tendencies to physical and mental peculiarities. I know it may be objected that this is a counsel of perfection, which, in view of the amount of book-learning required of the teachers, we have neither the means nor the time to accomplish. My reply is, that while books are most excellent in their proper place, we have had far too much of them, that many of them have proved positively obstructive and injurious, worse than a waste of time and money ; further, that sound, healthy students will not only acquire such knowledge as is necessary in a much shorter time, but will retain and be able to impart it with more satisfaction to themselves and pleasure to the pupil than if exhausted by prolonged effort to grapple with the mass of abstract ideas presented by many authors who are more remark-

able for ornate verbosity than for practical wisdom.

The affiliation of the training college with the university is an excellent move which ought to be extended. In those cases where training colleges are situated in towns remote from a university, an exchange of students might be arranged, for certain periods during the course. Also some system of travelling scholarships to give teacher-students an opportunity of visiting educational centres abroad, could, I should think, be carried out through Cook or Lunn or some travelling agency at comparatively small expense.

Above all things, what we want in the teacher, is good breeding and high-minded enthusiasm, and to escape from the narrowness on which Sir S. R. Wells has laid so much stress, we must strive every way, not only to expand the mind, but also to develop the sense of the brotherhood of mankind, and towards this end even a few fleeting visits to other countries will do more than the laborious perusal of books for many years.

We are islanders and while we fully appreciate the many advantages of what Kipling so aptly describes as "H.M.S. Great Britain," surrounded by the life-giving winds and waters of the great Atlantic, so rich in iodine, ozone, radium and fertilising sea-weed, yet we must candidly admit the justice of the reproach so

often urged against us, that we tend to become as insular in our minds and sympathies as in our geographical position, and it were more to our credit to honestly recognise, and acknowledge, the justice of the charge, and to take measures to correct it by widening our outlook, and culling the good from other nations.

The Swedes seem fully alive to the importance of attracting the best class of pupils to become teachers and are quite aware that to do so the life of the teacher, as continually before the children in the schools, must present not only as much of refinement and dignity as possible, but also of happiness and well-being, and to some extent with this object in view the teachers' apartments in the ordinary folk-schools are not only spacious and convenient, but well furnished and appointed in every detail. There are libraries, sitting-rooms and a small kitchen, so that the teacher, when opportunity occurs, can retire for a few minutes' rest and quiet, or have a light meal served promptly and appetisingly; further, the ultimate prospect before the teacher is one of promotion to the Central Educational Board, as a goal to be attained where in advancing years one may be surrounded by people of similar outlook and congenial tastes.

CHAPTER XIII

SCHOOL BUILDINGS AND FURNITURE

"Wisdom hath builded her house,
She hath hewn out her seven pillars."

In the conception of wisdom in the mind of the great author of this remarkable passage, there are associated many grand ideas, but perhaps the most prominent are those of vision, hope, work, power, patience, beauty and permanence.

Now all action is but the concrete expression of antecedent psychological concepts, and here again we see the necessity for that association and suggestion which we have defined as representing the educational value of an idea. "Where there is no vision the people perish," but without hope, the vision cannot stimulate to work, and without work, vision and hope cannot become effective, and power, patience, beauty and permanence fail to materialise. It is true that the work or effort in the first instance may not be much, yet even the smile of hope may accomplish great things.

Can there be any harder work than to hew pillars out of the solid rock? To produce from

the jagged, irregular mass, lofty pillars of comely symmetry? But even hard work is not enough, there must be the power to master the tools, to persist in their use, and to replace them with others when they are worn out. Therefore, to give effect to this power there must be patience. Wisdom will not be hurried, she knows that any work worth doing must take time, and that to reduce the rugged block of stone to the expression of her design, many a rough fragment must be hammered off, and many a projecting angle corrected or removed; and now when wisdom has accomplished all that was in her mind, builded her house and reared her seven pillars, surely the labour has not been vain and we see symmetry, order, shelter and beauty brought out of rugged irregularity and forbidding inhospitality. But perhaps the most striking suggestion of all is that of permanence. All ages of mankind seem to have taken the pillar as the emblem of stability. The ancients spoke of the world as being limited by the pillars of Hercules, and pillars always appear to have played an essential part in the designs of their temples, and in many instances they are the only portions of those temples still remaining.

We see, therefore, that wisdom does not work for mere passing effect: the conception is great, and the labour is great, but the result must also be great both in its effect and stability.

Certainly it is only befitting that the house should express something of the mind and character of the occupant. We do not expect to find a king in the squalid hovels of our slums, nor the unkempt and untutored peasant in a palace, and just as the house must indicate something of its occupant, so must the occupier be sooner or later influenced by the house. Even the vigorous and healthy cannot long retain their full health and vigour in an ill-ventilated and unhealthy house, neither can the clean and orderly long tolerate an environment of filth and disorder. It is the effect of our environment in early days that unconsciously moulds character and mentality, which plays so important a part not only in usefulness, but in our happiness and that of others with whom we become associated, either voluntarily or involuntarily in after-life.

Surely, then, it is our duty at the very outset to make our school buildings an object lesson to the children of the poor who are obliged, from the adverse conditions of our misguided civilisation, to spend the most of their time in squalid alleys or gloomy courts, where the houses are ill-built, ill-proportioned and badly kept.

Should not the few hours which these children are obliged by State regulation to spend in the State schools be made the most of to give them not only the best possible conditions of

sanitary surroundings, but also every opportunity of seeing and feeling the elevating influence of noble proportion and artistic colouring ?

Now, as we often learn most by our own mistakes or those of others, it may be interesting and instructive to give an account, not only of the points to be aimed at, but also of those to be avoided, observed in some of the numerous schools we have visited.

In 1906 I was one of the foreign delegates who had the pleasure of being present at the Sanitary Congress in Geneva, where a number of most interesting and instructive papers on sanitation in its varied aspects were presented by some of the highest authorities of the day.

M. Henri Baudet presented an able paper on " Swiss Schools from a hygienic point of view," in which he dealt more with the question of the buildings than with education in the narrower sense, in which the word is most frequently used.

It is evident, however, that the Swiss are keenly alive to the importance of the whole question, and they feel in the words of Jules Simon, " The country that has the best schools is the best country ; if it is not to-day, it will be to-morrow."

They certainly spare neither money nor trouble to give practical expression to the fundamental principle that the school building

itself should be the first great educator of the child.

The elegant and graceful buildings with their fine proportions, large windows and ornamental roofs cannot fail to be a great training to the eyes of the children, and to be a useful factor in the cultivation of their mental and moral aspirations. We had an opportunity of inspecting one of these buildings in Geneva: it was well placed in an open situation, towards the outskirts of the town, built of white sandstone and granite, and was certainly a most imposing structure, three stories over the basement. The front entrance was approached by a fine gravel drive, leading to a magnificent flight of broad stone steps, the windows numerous and large, and provided with outside sunblinds. The roof, supported by a very artistic cantilever, was relieved by two very elegant and graceful spires.

The entrance-hall was spacious and well lighted; opening off from it on either side were large committee and lecture rooms, and from the back two broad flights of stairs rose to the stories above, which were occupied by the children's classrooms.

The internal arrangements did not seem to me to be wholly satisfactory. The classrooms, which all occupied the front of the building, were large and well ventilated; the floor, which appeared to be of mosaic pavement, was covered

with linoleum. The walls had a good smooth surface, and were painted in light tints of terra-cotta and yellow. The angles were well rounded off at the corners of the rooms, and where the walls met the ceiling, but this was neglected just where it was most important, and at the junction of the walls with the floor there was a right-angle capable of harbouring any amount of noxious material. The class-rooms received their light and ventilation from the left side, the wall on the right side of the pupils as they faced the teacher being blank, so that the room was dependent for cross ventilation upon the door which opened into the corridor and a couple of ventilator gratings. Monsieur Baudet, in his paper, expressed the opinion very confidently that the light should always be received in a school-room on the left side of the pupil, but it is evident that physiologically this is quite unsound. Light is one of the most active agents in bringing about healthy nutrition and tissue growth, and it may now be considered fully established that light is as important an element as air in the struggle against many insidious forms of disease, and just as a plant will develop more actively towards the light, so children, if exposed for an average of 5 hours a day for some years to a preponderance of light on one side, cannot fail to develop unsymmetrically, and those children who occupy

the right side of the classroom will always have less light than those occupying the left side.

Quain shows us that the grey matter on the left hemisphere of the brain averages 7 per cent. more than on the right, which is principally attributed to the predominance given to right-hand movements. Now, if the children's heads are constantly exposed to a greater amount of light and heat on the left side, it will accentuate this unsymmetrical development which is already an active cause of premature senility. It is astonishing how error if confidently reiteraated with an air of authority, can become stereotyped on the human mind.

We see, therefore, that all classrooms should be so constructed as to provide for the free admission of light and air on both sides, and if during drawing or writing lessons the shadow of the hand upon the paper is found inconvenient, which appears to be the only argument to be entertained in favour of the left-hand light, then the teacher must be instructed to lower the blinds on the right side during those lessons.

By Dr. Montessori's method quite young children are taught to write in a few weeks, so that even this flimsy excuse for violating the normal physiological distribution of natural stimuli, to metabolic activity, can no longer be maintained.

The walls in the corridors and on the stairs were finished with a kind of pebble-dashing,

very elegant and ornamental, but quite rough and full of minute interstices capable of retaining any amount of impurities. The angles of the walls at the sides of the windows, doors, stairs, and at the junction of the floor were sharp.

The corridors, which were well lighted, terminated at either ends in W.C.'s and urinals, which were clean and well constructed, but calculated to intercept or contaminate the free current of air from end to end of the corridor.

The stairs were of stone, fourteen steps in each flight, which is too much without a landing, and two flights to each story. The entrance hall was reached by a number of steps which varied according as you entered from the front or back; it will be readily seen that the strain upon a young, growing child, nervous and anæmic, and perhaps suffering from dilatation of the heart, as so many children do, would be very serious, and further, in case of panic, the shorter the flights of stairs the less danger of serious accidents. It appears, therefore, most desirable that the steps be broken into shorter flights, and that school buildings, or at least that portion of them used for classrooms, should not exceed two stories over the basement, and that the basement story should not be too high. Of course, a third story may with great advantage be occupied by the teachers

or caretakers, or as store-rooms, etc., while the basement will be required for bathrooms, kitchens and heating apparatus.

In the school under consideration, the arrangements for douche baths were very elaborate, in a large room in the basement, the floor of which was provided with a wooden grating to allow of the rapid discharge of water. There were large, circular, douche jets, and a number of flat, circular tin baths for ordinary washing purposes (see Plate 48). We were told that it was compulsory for the children to have a bath in the school at least once a fortnight, but they could have it more often should they wish. The dressing-rooms off the bathroom were warmed in winter. There were also cloak-rooms, which can be heated if necessary to dry the children's clothes. The children were douched in squads, which is, of course, open to objection and with comparatively little increased expenditure might be avoided by having the dressing-boxes ranged round the douches and each douche enclosed in a waterproof curtain.

There was no swimming bath attached to the school, but children who desired it were presented with free tickets for the public swimming baths in the lake and river close by.

The heating by steam is, no doubt, a convenient method of distributing heat to a large building.

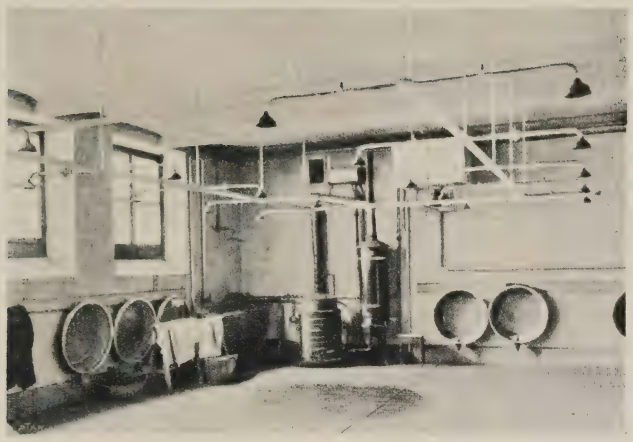

PLATE 48.—BATHROOM, SWISS SCHOOL, 1906.

PLATE 49.—COPENHAGEN SCHOOL BUILDING (see page 184).

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There was also a large dining-room and gymnasium, but as these were not completed at the time of our visit, we cannot offer any comment on them.

The covered portion of the playground, for use in wet weather, had a rough wood pavement, which appeared objectionable, being almost certain to retain a great deal of damp, especially as the sun could only operate on it very imperfectly; but this objection might easily be overcome by the use of some waterproof material.

Dr. Allyre Chassevant, in a very able paper, told us that French regulations require a space of 3·30 cubic metres per pupil, but that Upsala (Sweden) requires $7\frac{1}{4}$ cubic metres per head for a class of not more than 30 pupils, of 8·27 cubic metres per head for classes of 40; but he goes on to show that the accumulation of carbonic acid depends less upon the actual measurements than upon the movement of the air, and that it rises rapidly after a number of people have been assembled together for the first three-quarters of an hour, and will in that case be found to reach 3 to 4 cubic centimetres per 1,000, unless in cases where there is a positive current of moving air.

He strongly urges that in all cases the Swedish system of complete evacuation of every class-room, and opening all windows and doors, for at least 10 minutes in every hour should be

insisted upon. It is manifest that such a method is of incalculable benefit, not only from the point of view of ventilation, but also from the rest it will give to the children's eyes and the exercise for their limbs, back and chest, and the elimination of the products of mental fatigue which a few minutes' running and shouting in the open air will secure to them.

During the war when it was of the utmost importance that the output of the munition workers should be pressed to the maximum, it was found that, although the apartments had more than ample cubic space, yet the results were enormously increased after the introduction of fans to keep the air moving, and that the workers did not complain of anything like the same amount of fatigue.

The desks were of a good pattern, and so arranged that the height and angle could be easily adjusted, but the value of such adjustment was practically nullified by each desk being occupied by two pupils who would scarcely be in every case of equal height, and whose close proximity would greatly increase the danger of any infection that might be present.

The forms were attached to the iron frame of the desk and were not provided with any means of regulating either the seat or back.

It should be insisted upon that in any school which would claim to be up-to-date, each child must have an individual seat and desk, both

of which can be adjusted simply and quickly to the height of the child occupying it, and the back of the seat must be provided with a support for the shoulders and loins which also is easily adjustable.

This building, in a word, was the embodiment of the great principle of the Geneva people, that the children of the poor in their school hours must have the best of everything, that they must be brought into the best parts of the city, and that they must on their way to and from school mingle with, hear and see the best dressed and best educated people that are to be found in the town. The population of the whole canton would not be equal to one of England's large towns, and it is probable that there are many private individuals in England who could write a cheque equal to the combined incomes of all the people in the canton. The population of the entire canton was given as 132,609 in 1900. We see, then, that as far back as 1906, though their population was so small and their resources so limited, the Genevese fully recognised not only the educational value of the school buildings, and their surroundings, but also of the gymnasium and baths.

Edgar James Swift, in his work *Mind in the Making*, says: "The influence of suggestion through environment has never received its proper recognition in education."

Yet how often do we see schools for the poor in these countries, great clumsy, ungainly buildings, without either a bathroom or gymnasium, situated in some densely crowded part of one of our populous towns, where pure air and good light are practically impossible, and where a dirty yard, dusty and swarming with flies in summer, and liberally furnished with pools of muddy water in winter, goes by the exalted title of the playground, in which we are told the children at certain hours in the day are allowed out to get fresh air! Perchance, as we pass we catch sight of a pallid, anxious, exhausted woman, blinking through spectacles, restlessly moving to and fro, or in the act of administering a sharp reproof to some miserable ragged urchin, who regards it as the triumph of his existence to cause suffering or trouble to some of his more feeble companions. Very often in the back of the teacher's mind, there is an earnest longing to rescue and raise these poor little creatures from the squalor and degradation, which at every turn clamorously declares itself. She may even have a vision of some scheme which would effect improvement, but how is she to accomplish it! Will her committee or board tolerate her suggestions, and is she not herself conscious of her own physical and mental exhaustion, and perhaps of the rapid approach of that dismal period when she must take her pension and sit down

in lonely seclusion to watch the shadows of her approaching dissolution steadily closing in upon her?

Sir George Newman's recent report says:

"Many of the school buildings are defective, especially in some rural areas, some having fallen below a reasonable health standard, owing to money stringency in recent years. The six most frequent sanitary defects are unpaved or unsuitable playgrounds, lack of water facilities, inadequate cloakrooms, uncleanly classrooms, insufficient heating in winter and unsuitable desks."

We must not forget that the educative influence of school environment, so important for the children, is also continually operating on the teachers, many of whom have grown up under the very limited surroundings to which we have referred, and have not yet risen to either the physical vigour or the mental dignity which the child so much appreciates, and which is such an inestimable factor in preserving discipline and accomplishing work, with a minimum of difficulty and fatigue.

Well-proportioned, well lighted and ventilated buildings, strong and elegant in conception and execution, telling the tale of a highly cultivated mind in the architect, and a generous heart in those whose open-handed liberality have supplied the necessary means,

not only tend to the physical and mental well-being of all who may be occupied in or about them, but also to that respect and esteem for the work of others, which is one of the best possible incentives to strive towards excellence in ourselves. Anything approaching extravagant display and gaudy vulgarity must above all things be avoided, for these things rouse feelings of turbulence and envy, but the expression of power and mastery obtained through patience and hard work is much better understood by what we call the "masses" than they are usually supposed to be.

CHAPTER XIV

SCHOOL BUILDINGS (*continued*)

Scandinavian Schools

In the winter of 1924 I spent some months visiting schools in Denmark, Sweden and Norway, Holland and France, and would like to bring some of the points that seem to me most important before you.

In the first three countries, where possible, they place their schools on high ground in as open spaces as can be procured within reasonable distance of the populous parts of their cities.

What are called the folk-schools are large buildings, usually three sides of a quadrangle, and sometimes running up to five or even six stories high. Internally their arrangements are magnificent, but their appearance externally, while business-like and impressive, leaves a good deal to be desired from the æsthetic side of the question. It is, of course, self-evident that the more pupils and teachers accommodated in one building, the less the expense per head, and as there are sometimes 2,500 children and 50 or 60 teachers, together with officials in

various capacities, the buildings must of necessity be on the extensive scale.

The gymnasium alone will often be 90 or 100 ft. long, 50 ft. broad, and some 25 ft. high, and of these there are generally two and sometimes three in the larger schools. Then there are committee rooms, teachers' apartments, museums, chemical laboratories, libraries, an assembly hall for prayers and music, etc., large dining-hall which with the bath- and dressing-rooms, medical and dental clinics, furnace rooms and kitchens, occupy a considerable space in addition to the classrooms, corridors and stairs.

Plate 49 shows one of the finest schools in Copenhagen, and you will see that there is a considerable open space, neither houses nor large trees to interrupt the light or the air. In the top story of the central building there was perhaps the most beautiful dental clinic that I have ever visited (Plate 50). Plate 51 gives a view of the interior, showing the head dentist at work in one of the bays. Plate 52 shows the ground plan. The fittings and appointments were in every respect simply superb, and I have never seen any dental hospital at all equal to it.

The chairs, we were told, were the best that could be procured in America, the surface was of white enamel on which the smallest speck of dirt could at once be detected, the lighting

PLATE 50.—GENERAL VIEW OF DENTAL CLINIC.

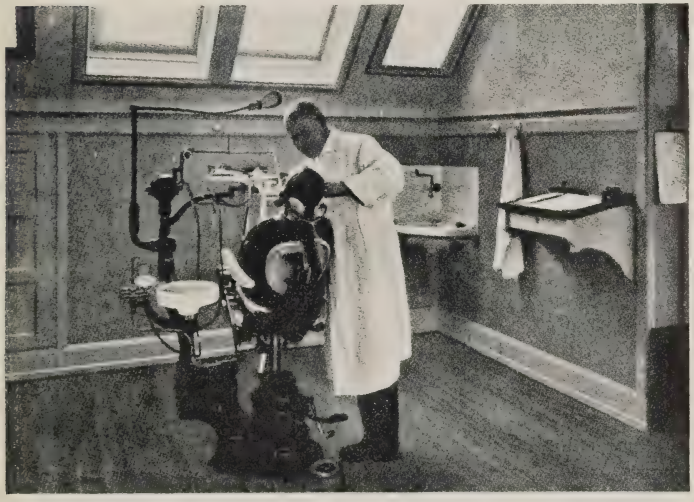

PLATE 51.—DENTAL CLINIC.

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being admirably arranged from the roof. Everything was spotlessly clean, and it did not appear to me that any micro-organism could possibly maintain an existence, as even the most minor details of sterilisation were carried out to the utmost. We were most courteously received by the head dentist; he told us that in all there were five dentists, and that the clinic served three schools; that in 1,000

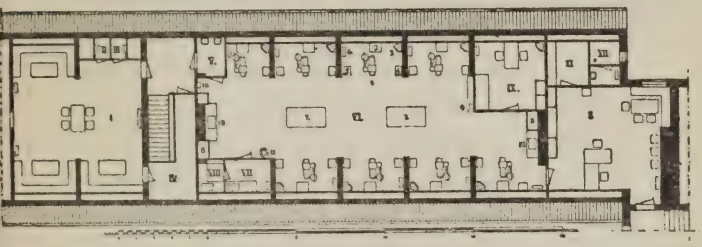

PLATE 52.

children that he had examined, he only found six perfect sets of teeth, which he considered to be largely due to the increasing tendency to use soft foods and to swallow them imperfectly masticated.

The details of the administrative organisation were simple and most complete. Boys and girls had different coloured cards on which the names, dates and particulars of their condition and treatment were clearly and concisely entered. We saw a large number of children waiting their turn, looking quite happy and chatting cheerfully with each other, making it

quite evident that their previous experiences and those of their friends had not only not been painful, but, on the contrary, quite pleasant and interesting. The children bring their own toothbrushes, in the sterilisation and use of which they are carefully instructed. Indeed, our own experience of the visit proved so instructive and agreeable in every way that we felt quite sorry when it was over.

Plate 53 represents what may be taken as a good type of the Stockholm folk-schools. It is placed right on the top of a hill of the truncated cone formation, and, although situated in a populous part of the city, looks over the tops of the houses in every direction, and is surrounded by a considerable open space, allowing the freest possible circulation of air and light. It is, as you will see, the usual three sides of a quadrangle, rising to four stories, and at some places five on account of the slope in the ground. There are 1,800 pupils and 50 teachers on the roll. The stairs and corridors are broad, well lighted and ventilated, and at the angles of the building where the corridors meet they are enlarged into roomy semicircular windows, artistically arranged with shrubs and plants, which looked as healthy and happy as the children themselves; although it was the middle of winter with frost and several feet of snow outside for months. The floors in the corridors are laid

PLATE 53.—FOLK-SCHOOL AT STOCKHOLM.

PLATE 54.—SCHOOL-BUILDING AT GOTHENBURG (see p. 191).

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with square flags which seemed to be some kind of marble, giving a beautifully true smooth surface, which should dry quickly after being hosed down. In the corridors there are the usual wash-hand basins and drinking fountains, which latter deserve a few words of description.

In the centre of an ordinary white circular stone basin there is a fountain which throws a jet of water straight up about 8 or 10 in. high, over which the child stoops when drinking, so that no cup or vessel, with all the objections of contact with many mouths, is ever necessary. In some of these fountains there is a plated ring raised on a support from the bottom of the basin to prevent the possibility of any child putting the lips right down to the fountain tube.

The floors in the class and other rooms are laid in narrow oak boards about $2\frac{1}{2}$ in. broad, so well closed that the joinings could scarcely be seen, the whole forming a beautifully polished surface. The walls are coloured with distemper in a pattern which looked like wall-paper and was very pretty.

There were three very fine gymnasia, in two of which classes were being held at the time of our visit; they were furnished with rib stools, plinths, ropes, etc., common to the Swedish gymnastic system.

In the bathrooms we witnessed a class which was most interesting and amusing; the washing and douche room was a large, airy, well-lighted

apartment about 30 ft. square; ranged along the side were a number of square foot-baths with a seat above them: all built of glazed white brick, similar to the walls of the room. In the centre of the room there was a double row of basins at which 20 small boys between 7 and 8 years of age, having washed their feet and legs in the foot-baths, were busily soaping themselves all over and chattering and laughing. They were presided over by a ponderous, motherly woman, who, when she considered the soaping process sufficiently satisfactory, ordered them in groups of five to the end of the room under the douches or shower baths. When the douching was over, they were marshalled into the next room, where there was a magnificent swimming bath, and I do not think I have ever seen a flock of young ducks take to the water with more thorough enjoyment. The rooms were heated to a temperature of about 70° F. These gymnastic and bath classes are considered even more important items in the curriculum than the classes concerned with book-learning, which, unfortunately, occupy practically all the horizon in these countries.

In the southern wing of this school there was a special suite of apartments for children who had been under treatment in tuberculosis sanatoria, and although discharged as cured, were kept under observation for a further period

separated from the rest of the school. There was a large classroom, the southern side of which was closed by a number of sashes, extending from a few feet above the floor to the ceiling; each sash revolved upon its centre in such a way that the whole side of the room could be open when so desired. Off one end of the room there was a most convenient little kitchen where the children's meals were prepared. At the other end a staircase descended to a large dressing-room where, hung upon numbered racks, were sheepskin coats with the wool on, hoods and skin over-shoes and gloves. The school day was broken by two periods of an hour each, which would vary with the time of the year. The children, when dismissed from their lessons in the classroom, went down to the dressing-rooms and, having donned the coats, etc., went out to an enclosed space in the open air where there were a number of iron bedsteads, with spring wire mattresses on which the children lay for an hour. If it was snowing or raining, waterproof covers were provided.

The teachers' apartments, consisting of sitting-rooms, library and kitchens, etc., were spacious, well lighted and elegantly appointed, and have proved themselves to be of the greatest possible value, not only from the opportunities of rest and refreshment which they afford, but also for the purpose of exchanging ideas or

looking up authorities in the library on any questionable point that may arise.

There is also a library to which the children have access at certain hours and from which books can be borrowed. The classes, together with the ordinary school subjects, such as history, geography, reading, writing, mathematics, etc., include gymnastics, singing, baths, English, French, German, paper, wood and metal slöjd, drawing, mechanics, cooking, sewing, laundry, physics, hygiene, chemistry, physiology, rudimentary anatomy.

The cinema is made great use of in several departments. The laundry class is conducted in a separate building. The classrooms are large, airy and well lighted. The ventilation is carried out by an arrangement in conjunction with the heating apparatus, placed in a press, open top and bottom, so that the air is admitted to the rooms heated to any desired temperature.

In some of the classrooms each child had a separate desk, while in others two children shared a desk. By means of a simple prop, which can be turned upwards inside the desks, they can be converted into flat tables when desired. The floors, though so excellently laid in well closed up narrow boards, in some of the rooms were covered with linoleum.

The dental clinic was very elaborately fitted up, the chairs were up-to-date in every respect,

clean and beautifully kept, but, being finished in black enamel, did not give the bright appearance which was so very attractive in the Copenhagen clinic.

We were very much struck by a simple but very effective arrangement of a large dental antiseptic cream tube, from which, when a sufficient quantity was discharged, it was cut off by a revolving blade, in appearance something like the propeller of a steamship, and held to one side free of the tube, hanging from the under-surface of the blade for the child's toothbrush, so that the brush would not come in contact with the opening of the tube.

Plate 54 is from a photograph of one of Gothenburg's fine school buildings.

The most essential points in a school building are that it should have good bath- and dressing-rooms, gymnasium, teachers' apartments, slöjd rooms, laundry, museums, dining-hall, suitable kitchens for teaching class cooking, and that all classrooms should be lighted and ventilated from both sides, that all corridors and stairs be broad, well lighted and ventilated; that the flights of stairs be broken with frequent roomy landings, and that in consideration of the size of many of the children, the rise should be limited to a maximum of 6½ in. I am told there is a law in existence that in public buildings there should not be more than 12 or less than 2 steps to a flight, single steps having been

proved to be very dangerous. That the walls and floors should be hard and smooth, that all angles should be replaced by curves, and that the floors should have a slight inclination towards a scupper to take off the water when the rooms are hosed down, once a week or more often in case of an epidemic.

The scupper must be closed by a door or plug, or other suitable device to prevent a draught along the floor when not in use.

The windows should be of the French, or some similar pattern, so that they can be completely opened in warm weather; recent researches have shown that sunlight loses much of its essential health-giving properties by passing through glass, and as the metabolism of childhood seems to be particularly influenced in this way, every effort should be made to admit the greatest possible amount of sunlight without the interposition of glass.

Dr. J. L. Dick says:

"The essential factors in producing rickets are: The defective housing and overcrowding, and the slum conditions under which the children live. The great majority of the children from whom these statistics are taken live in two or three roomed houses, frequently in one room, and in one of these rooms the cooking for the family is done. The consequent absence of sunlight, want of ventilation, confinement and overcrowding, to which such conditions lead, associated with the want of proper exercise

necessary for the growth and development of the child, are the factors which will inevitably produce rickets, no matter whether the food be good or bad. If, in addition to these factors, there is a deficiency of proper food, especially of the nitrogenous element of the diet, the condition will be aggravated.

"Rickets is not common in tropical and sub-tropical countries where the life is much in the open and sunshine is abundant. And yet there is no race immunity, for the negro races and Italian races suffer severely in the cities of America. Italian children in London are often markedly rickety. In Canada, though the winter is prolonged and cold, rickets is rare, owing to the healthy open-air conditions. In Australia rickets was very uncommon, but there is evidence to show that it is developing in proportion as the towns grow in size and density of population. In Vienna, with its double windows and air burnt up by hot stoves, rickets is stated to be excessively common."

In examining the drawings of quite a number of modern schools in these countries, I am sorry to see that very few of them have even a gymnasium, and I have not seen one with a swimming bath. Most of them are of the quadrangular type, with the corridors opening to fresh air and sunlight only on one side, and the classrooms still, unfortunately, derive their cross-ventilation from these corridors. We too often see the corridors enclosed by class or other rooms on both sides and depending for

their supply of light and air upon these rooms, the end windows, or in single-story buildings, possibly from the roof, which can never be satisfactory. Personally, I prefer to see each classroom built separately at right-angles to the corridors, windows at both sides giving full cross-ventilation.

Through the courtesy of the architect, I have recently seen the plans of a large school which is now going up in one of our great cities, at an estimated cost of £29,000. It is quadrangular. There is no bathroom and no gymnasium, but there is a central hall which he said could be used as a gymnasium.

This just expresses the attitude of mind in these countries. A gymnasium may be tolerated, but only as a matter of secondary importance, and a bathroom is supposed to be a luxury for the idle and self-indulgent. To be able to recite the dates of British battles, or the branches of the Irrawady river, or to parse a sentence in grammar, are all held in higher esteem than the development of the physique and the joy of cleanliness and muscular power.

When will these countries see that the bathroom and gymnasium are the root of the whole matter, and that books are only too often the east winds which nip the blossoms before they are set in the early springtime of life, leaving blight and decay in the place of beauty and hope?

CHAPTER XV

SYSTEMS

"Let everything be done decently and in order."

On this occasion we will direct our attention to some of the most prominent systems of education.

As far as my knowledge goes, England has never given to the world anything deserving the name of a system of education. Slöjd, which originated in Finland, has been brought to such perfection in Sweden, that it is now generally known as Swedish. Froebel's kindergarten hails from Germany; to Italy we are indebted for Dr. Montessori and America has given us Daltonism.

Some time ago Mr. Fisher is reported to have said the English system of National Education was misnamed, because it was neither National nor a system, and this is easily explained, for there seems to be no consensus of opinion in England as to the fundamental principles underlying education, and as long as everyone does what is right in his own eyes it is not deserving of the name of being national or a system.

As the American Ambassador, whom we have already quoted, has pointed out, the reason for doing anything in these countries is that it has been done, and for not doing it is that it has never been done.

Such an attitude of mind is obstructive to progress, and tends to paralyse effort in those who would strive to put the position on a more progressive footing.

" There is no one so blind as those who will not see, nor so deaf as those that will not hear," and the unfortunate individual who would disturb the profound hypnosis of self-satisfaction, can only expect trouble and dislike for his reward. Nevertheless, all sensible people who love their country, and would strive to raise mankind, must tell the truth no matter how unpopular it may be, and we believe there is evidence to show that the truth prevails in the end, although it may be long delayed.

In my early days I was medical officer to the Marston Green School Homes near Birmingham, where there was an average of 400 children, and where I first had my attention seriously directed to the school-child and education. But during my studentship, having been bitten with an enthusiasm for anatomy, I left Marston Green and obtained an appointment as lecturer and demonstrator in anatomy in a medical college. I also joined a firm of

"grinders" and carried on medical teaching in private as well as in the colleges for about 15 years.

The medical colleges were recruited from the public schools. Young men or boys from 16 to 19 years of age, having passed their entrance examination, were handed over to us. We found they knew a little classics, mathematics, geography and history, etc., but that they were, as a rule, quite incapable of making correctly the most simple observation on the most palpable concrete evidence that could be placed before them. They had never been taught to use their eyes, their ears, their sense of touch, or of muscular co-ordination, nor to make deductions from evidence even when it was carefully explained to them.

Occasionally, however, we would get a boy from the country who had gone to a day school, who had observed the birds and the animals, the trees and the crops, the weather and the seasons, who could make a good guess at the weight of an apple or an egg, or the breadth of a stream that he was thinking of jumping; he, no doubt, lacked the smart self-confident manner of the public-school boy, and was considered quite an inferior type of creature, until the examinations came round, and then they were all obliged to admit that they were beaten.

These calm, strong, often rather silent young men, who could give the most concentrated

attention to what you were saying, and analyse every word of it, were a great comfort to us, and made teaching a joy instead of a labour. I have watched many of them through lives of the highest distinction and usefulness. One of them died recently in London, having won the blessings of mankind for his extraordinary work in the alleviation of suffering, the benefits of which in a few years have spread to every corner of the habitable globe.

The effort to make up for lost time is always depressing, for time is just the thing that should not be lost, and in dealing with the majority of these young men one frequently felt tempted to become disheartened. We had, however, constantly before us the encouragement of the wonderful change that came over them after one or two years' work in the dissecting room. Intelligence began slowly, but in the majority of instances steadily, to unfold, they became capable of concentrating their attention, the restless wandering uncertainty, so prominent a characteristic of exhausted or ill-developed nerve-centres, gave place to keen interest, alert watchfulness, and even positive enthusiasm to trace out to its destination the artery, nerve, tendon or other structure, to examine its relations and to discover, if possible, the *raison d'être* of the particular portion of the system under consideration.

The handling of a sharp knife and dissecting forceps, especially in lifting a delicate fascia, thinner than the finest silk, not only cultivated attention, but also the sense of touch and muscular co-ordination, so that, after a time, the consciousness of mastery gave a man pride in his work and he felt he could carry it out confidently almost with his eyes shut.

The ultimate results in some of even the most discouraging cases were so striking that I could not help longing to devise a means of placing these advantages at the disposal of the public who had not the opportunity of working in a dissecting room; I felt that it must be some system of dealing with graduated concrete exercises, which must be interesting and tend to a satisfactory conclusion.

About this time I heard of Swedish slöjd, and having procured an introduction to Herr Salomon, director of the Slöjd School, Nääs, near Gothenburg, I went there in 1897. I was only a few minutes watching the pupils at work, when I said to my wife, this is the very thing; here is my ideal an accomplished fact, we must come here again; we could not stay then as we were due at a medical congress in Moscow. We returned the following summer and became resident pupils.

The school consists of a number of houses scattered over a most picturesquely situated estate surrounding a beautiful lake, from the

shores of which hills well clothed with trees rise in various directions. There are steamers and numerous boats on the lake.

(Plate 55.) We rose about 6.30 a.m., and as our room was in the main central building, we had only to come downstairs while those from the other houses were assembling. In one of the recreation rooms morning prayer was held and hymns sung to the music of a harmonium. At 7.30 the bell went for breakfast, and at 8 we were summoned to our various classes. The rooms were all well lighted and ventilated; in fact, during our stay windows and doors were practically never shut, and many of the lectures and gymnastic classes were in the open air.

Our usual routine was work at the benches for two hours after breakfast, then fall in for ten minutes' gymnastics, which consisted of marching, singing, and a variety of free movements of the arms, neck and trunk. We were then dismissed for a short period of rest. At 11 there was a lecture by Herr Salomon on the principles of education. Lunch at 12. At 1 we returned to our benches or other classes (drawing, etc.). At 3 there was an interval, for gymnastics and rest, after which work was resumed until 5, when we had dinner, and work was over for the day. You could return to your bench, write letters, discuss various matters with people who always seemed in-

PLATE 55.—SIÖJD SEMINARY, NÄÄS FLÖDE, SWEDEN.

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terested in everything, join in the athletic games, or row on the lake, in which the Scandinavians were particularly proficient. Supper at 8 p.m. was followed by music, indoor games, etc., until 10.

The food was simple, but very good, well cooked and nicely put on the table; everything was clean, and everybody seemed healthy and happy. Personally I look back upon it as the happiest time of my life, and would much like to have gone for another term, but the opportunity has not occurred since.

Slöjd

"A little thing is a little thing, but faithfulness in little things is a great thing."

A brief synopsis such as the present is more for the purpose of suggesting the consideration of principles, than of entering into details, yet it may perhaps save time, subsequently, to give at all events a few headings of the courses which considerable experience in other countries has shown to be the most useful in laying a good foundation of physical energy, and that most inestimable but misnamed quality called commonsense.

As the system known as Swedish Educational Slöjd covers more of the ground and has unquestionably produced better results than any other at present extant, it may be desirable to give a brief review of its history and methods

before we allude to the other principal headings to be dealt with in anything like a comprehensive scheme of primary education.

The word slöjd is derived from an old Swedish word slog, meaning belonging to the hand, hence handy, dexterous; it is probably the same root that has given rise to our expressions slogger, sleight.

On Swedish farms there is generally to be found what we would call a "handy man," and he is known as a slöjdare; he always carries a knife of strong but simple construction, which has hence become called a slöjd-knife. This man has usually received no special training, but, nevertheless, can generally mend carts or harness or furniture with more or less skill.

It would appear that some fifty years ago the principles of education in Sweden were somewhat similar to those of the present day in these countries, and an effort was made to force information out of books into children's minds, whether the information was presented in an uninteresting or unsuitable manner or not. The consequences were naturally disastrous, hence the idea, which it appears originated in Finland, and was subsequently developed by Herr Salomon, that the only proper avenue through which to appeal to the developing intelligence of the young child, is through duly regulated and diversified physical observations by means of the senses, and that the effort to

force mental activity of an abstract nature upon children at a period of life when the mind cannot yet be said to exist can only result in weariness and failure both for pupil and teacher.

The system, therefore, of making simple articles with the most simple tools suggested itself and has been carried out with the most marvellous success for the past fifty years.

The aims of the system are to interest the child, and to procure absolute concentration upon the piece of work in hand for limited periods, to train to the utmost accuracy and precision, and so to cultivate the eye to the greatest exactness of observation and the hand to the utmost delicacy of touch.

It is, therefore, a cardinal point in educational slöjd work that there must never be any hurry to finish a model, but that rather a number of models be rejected than that one be carelessly handled or finished by any other methods than those prescribed, the object being in no case to produce the model, but to develop the patience, obedience, powers of concentration, and perseverance of the pupil, and hence the pupil must be constantly under the observation of his teacher, lest while acquiring what is excellent in one direction he may unconsciously fall into bad habits in another.

A few moments' contemplation of the accompanying illustrations will perhaps do more

to emphasise the underlying principles of educational slöjd than could be attained by writing an additional chapter.

Plate No. 56 shows a group of slöjd boys at work; observe that in every instance the teacher begins at the beginning; that the utmost possible attention is given to all the details of position, so that the weight of the body may be properly distributed, the centre of gravity falling well within the base of support, and that the operator in no case has to trust to either the tools or the bench for maintaining his equilibrium.

It has been demonstrated by experiment in a factory workshop that the result of these methods is not only more work done in a given time, but that it is better executed, and with less fatigue than when the correct physiological position was neglected.

The back must always be kept hollow, the chest well expanded, the feet placed at such angles as are best calculated to increase stability, and the left side of the body is given a due share of attention, for you will see that numbers 10 and 11 are holding the handle of the plane in the left hand; this is with the object of developing the grey matter on the right side of the brain, which, according to Quain, is nearly 7 per cent. less than on the left side.

Plates 59 and 60 represent boys and men working at carpentry. It will be seen that,

PLATE 56.—SLÖJD BOYS AT WORK.

PLATE 57.

PLATE 58.

PLATE 57.- Represents a Slöjd boy engaged in the first stage of the first model, which is simply to cut a piece of wood straight with an ordinary Slöjd knife. It is unnecessary to point out that absolute concentration is essential to procure this result, and that when it is accomplished the boy has gained, if he never possessed it before, a sound physical impression of the moral attribute of truth and justice. Observe the boy's position, that his chest is well raised, his shoulders back, his feet well apart, and his toes turned out.

PLATE 58.—The second step of this first model is to produce another true surface at a right angle to the first, and then to complete the remaining two surfaces, all of which must be to exact measurement, and each at right angles to its neighbour, and parallel to its opposite.

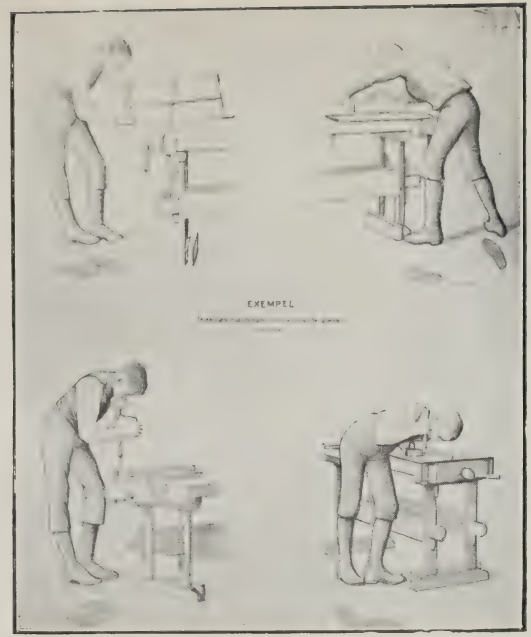

PLATE 59.

PLATE 60.

BOYS AND MEN AT CARPENTRY.

PLATE 61.—DEFORMITIES ACQUIRED FROM BAD ATTITUDES.

although very intent on their work, they are quite indifferent to their position.

Plate 61 shows some of these men stripped and photographed from life. These men cannot live out half their days, and even during their period of life they cannot possibly put the energy and ability into their work that they would were they symmetrically developed. Their chest-walls become fixed quite early in life, rendering a man in his prime prematurely old; their lower limbs twisted and distorted, so that walking, instead of being pleasurable, is painful and wearisome; the abdomen becomes pendulous, the stomach and bowels dilated and atonic.

It will be seen, therefore, that technical instruction, though excellent in itself, may be very destructive to the individual, unless it is in the hands of a true educator who grasps the fundamental principle of making the individual, not merely producing the commercial article, such as a chair or table, while the individual is being destroyed.

These diagrams illustrate the disastrous consequences of endeavouring to arrive at an end without giving due consideration to the principles involved in the steps taken to attain that end.

For although the boys grown into men here represented may have acquired some practical efficiency in the use of tools, it has been at

the expense of their health and energy, and the contracted chests, spinal curvature and distorted limbs shown in Plate 61, which were taken from life, demonstrate how much calamity and trouble might be averted by early attention to sound principles. For, as we have already seen, without due attention to the respiratory, digestive and muscular functions, the quality of the blood stream must suffer, and we will find ourselves in the unpleasant position of trying to build up strong muscles and nerves out of a poor and feeble blood supply.

Further, these illustrations show some of the evils into which people are falling every day who merely take up slöjd, not in its educational, but in its economic aspect; in other words, when we partially opened our eyes some few years ago to the fact that the Continental nations were outstripping us in the race of life, the cry was raised that we must have technical education, and in numerous large centres artisans of various kinds were appointed to instruct young people in technical pursuits; these artisans had never had the advantage of being really educated themselves, and while they taught their pupils to execute the particular piece of workmanship in question, they were entirely occupied with the work and ignored the pupil, and hence in many instances the last state was worse than the first. From an economic point of view, it is of very little

value for a man to be able to make a table or a pair of boots, as specialists who devote their lives to these things and avail themselves of machinery can always produce them more rapidly and at less cost than those otherwise situated; but from an educational point of view, a table or a pair of boots may be made the means of teaching a pupil patience, perseverance, obedience, accuracy and concentration to a degree that would scarcely be believed; it should also be the means of developing his muscles, strengthening his nerves and giving him self-reliance and a respect for well-done work of any kind, which is most important in every well-balanced mind.

A full course in Swedish slöjd comprises, as well as work at the bench, athletic games, drawing, singing, marching and drill. This combination is found to work most admirably in training the physical and mental faculties of young people, and at the same time maintaining so active an interest in all they do, that a love not only of their teachers, but of their school becomes permanently established, and the experience that the acquisition of knowledge has been associated with so much pleasure and benefit inspires a thirst for further attainments in this respect, and thus the pursuit of investigation becomes a habit which in a little time is part and parcel of the individual himself.

The tissues of the body have a consciousness of organic need, which, if not satisfied, produces restlessness, although the individual may be quite unaware of the cause of the restlessness. The satisfaction of this organic need is well expressed in the passage, "Something accomplished, something done, to earn a night's repose," or more tersely in the simple words of the classics, "*Mens conscia recti.*"

Herrick says: "The expenditure of intelligently directed energy along lines of fruitful endeavour is probably the highest type of pleasure known to mankind."

All skilful trainers of the child will aim at bringing the daily task to this point of satisfaction, as restlessness at any time, but especially in childhood, is most damaging. This is one of the dominant principles of Swedish slöjd, for not only is each model complete in itself, but in each stage of a model the child can see of the travail of his soul and be satisfied.

The beneficial effects of this system upon the Swedish people have been so manifest that it has rapidly spread all over Norway, Denmark and Germany, and to a large extent in France and America, but has only been very feebly taken up in England.

From a strictly professional point of view, we feel that we cannot exaggerate its importance, as the accuracy acquired by the concentration necessary to carry out all the measurements of

the models, as well as the delicacy of touch and handling which they require, are an invaluable training, not only of method but also of detail.

Schofield, in his work on the education of the unconscious mind, says: "The habit of perfect execution is invaluable, but must be taught early." Perhaps no other mental habit leads to greater success in every calling in life. Slöjd is the physical means by which the habit is best taught in childhood; for the essence of slöjd is not what is made, but that it should be perfectly finished in all its parts.

We have urged the necessity of insisting on the concrete method of demonstrations in early life, and if this had been carried out in a properly systematic manner, we would now be in a position to place at all events some of the earlier abstract problems before the mind of the pupil; but unfortunately, in the majority of instances, such is not the case, and the effect of placing abstract propositions before a mind which has not been built up upon concrete observations is merely to produce headache and confusion. While, on the other hand, the mind that has been trained to close observance of natural phenomena, which always stand in definite proportion and relation to each other, such a mind when brought in contact with an abstract problem, can by the faculty which is sometimes called apperception, supply a suffi-

cient number of links in the chain to enable it with more or less ease to arrive at the unknown quantity.

Schofield, to make this point clear, gives an interesting illustration: he points out that if a child sees the outline of a dog, it represents a dog to his mind, while to a dog, the mere outline represents nothing, but the completed picture will often make the dog growl and bark. In this case the child fills in the outline from previous concrete observations, which have been stored in the unconscious mind; the dog does not seem to be capable of supplying the factors necessary for completion of even this simple problem.

In how many cases do we observe a similar absence of capacity on the part of the pupil to fill in even the most obvious factors in an equation which is presented to his observation. It is manifest, therefore, that if we would make useful men out of the material placed at our disposal, we must accept the situation and begin at the beginning.

It is to be feared that too often while we expect the pupil to be quite a proficient in grammar and geography, the dead languages and mathematics, we fail to devote that amount of attention and training to the cultivation of manual dexterity, and of the faculty for close analysis of our natural surroundings, which these important matters demand.

We have a personal knowledge of several educationalists who have taken a course in this subject at the Seminarium at Nääs in Sweden, and a few in this country, all of whom are unanimous in expressing astonishment at the extraordinary capacity which this system possesses for the cultivation of faculty, even in those who have already passed the meridian of life, and also that this process was throughout associated with the most distinct sensation of pleasurable interest, resulting in a marked increase of healthful activity of both mind and body.

Sir Michael Foster has said :

" It is not the facts, it is the right way of viewing these facts, the right way of thinking about them, which is the essential need. If the mind be put in the right way, the facts can be gathered up and put in their proper place at any time, even in late after-life. But the mind can be fixed aright only in the early years of training. . . ."

CHAPTER XVI

SYSTEMS (*continued*)

SOME people may object: We already have physical development in our schools; we have kindergarten, songs and some kinds of manual work, and there are many other things much more useful for which there is no time.

If kindergarten, singing and manual work are properly taught they are excellent—but are they so taught?

At a recent visit to a large school in one of our great cities, we were present at a singing class of, we were told, 74 children, boys and girls. Some of them sitting in a crouched position hanging over their knees, others lounging for support against the desks or walls of the room. They all appeared more or less tired, and anxious to put in the time in any position that could give them the least possible exertion. The teacher had a good voice and seemed to be quite an enthusiast from a musical point of view, but had not the faintest idea of the grand opportunities for chest and throat development and muscular training of which she was failing to take advantage.

The room was an ordinary classroom, cumbered up with desks and seats, and although the children could quite well have been taught to stand properly with heads up, chests raised, shoulders back, they could not have been marched. Now the developmental advantages of combining marching and singing, as they do in Sweden, cannot be exaggerated, but here again it becomes a question of the training of the teacher to be an educator and not a mere blind class instructor. On the whole, the children's voices seemed to be good, and it was positively painful to see the languor and indifference on their faces, the postural deformities which they were actually cultivating, and how very far below the mark, even from a singing point of view, they must inevitably fall, from the lack of chest and throat development, and of that wonderful sense of satisfied organic need which pervades the tissues, although unconsciously, when we attain to the best possible of our limitations.

Froebel's Kindergarten

Froebel's idea of kindergarten may be found in the very name, "children's garden"; his whole system was a play and the gifts looked on as toys, not as pegs on which to hang long theoretical explanations, while the children sit listening drearily.

A skilful teacher should for the time become

a child, and by means of play with the gifts educate her pupils' sense of beauty, form and touch—should try and regard things from the child's standpoint, not expect the child to look at it from hers.

The lessons, as much as possible, should be given in the open air, and should be graduated to the age and disposition of the child.

Froebel says: "The child is not born to think, but to do, and be active."

In the history of mankind we find man active in the early ages and in the later ages reflective and thoughtful. The development of a child is exactly parallel with that of humanity. The development of the race repeats itself in the development of the individual, and from this Froebel argued that the activity of the child should be used as the agency by which its early education should be promoted. "Nature," he says, "was my college, the tree my principal, the nursery my university and children my professors." He endeavoured to show that we need not consult books and men, but nature and children.

Froebel's kindergarten, as arranged in the *Paradise of Childhood*, is suitable for little children from 5 to 8. If taught as he intended, the object-lessons should occupy 20 minutes, then the children should go outside and play games, sing, or have drill for about 20 minutes.

The whole school time should not exceed 3 hours.

From the age of 8–10, they are too big for kindergarten, and too small for so-called advanced kindergarten. This time would be best devoted to object-lessons, drawing, kindergarten slöjd, bast work, needlework of various kinds for the girls, drill and games for at least half an hour every day. Whatever they do should be executed with accuracy and neatness, for this is just the age in which to inculcate habits of orderliness and cleanliness.

From 10 or 11 years the physical powers are increased, and require an outlet; one of the best outlets has been proved to be Swedish educational slöjd—if properly taught.

An artisan as a teacher, or a teacher who regards the woodwork from an artisan point of view, are very much the same and both very bad, for they think they know all about educational woodwork if they have gone through some kind of course which they consider educational, but which, in reality, is pure handicraft or technical instruction. In most cases carpentry is what it should be called.

If you ask them the difference between educational woodwork and carpentry, they will tell you that the models are smaller, and made from drawings, and that the educational value of it is the drawing, and dexterity in manipulating the tools.

This is the chief aim of what is usually known as English slöjd, and the work consists mostly of preparatory exercises and very few finished models.

Now preparatory exercises have been proved not only unsatisfactory, but even injurious from both a psychological and a physiological point of view, and the failure to finish most disturbing to the organic need already referred to, resulting in restlessness, loss of interest, and the pupil becoming desultory and indifferent.

The aim of true slöjd as taught in Sweden is to develop the physical, mental and moral powers of the child ; to this end it goes from the concrete to the abstract, from the simple to the more complex, from the known to the unknown, the senior pupils being encouraged to devise new models.

Therefore, in true slöjd, the child prepares the wood, makes the drawings on the wood, works with his tools down to the drawings, till the models are completed. When it is quite finished in the concrete form, he from his wooden model makes his drawings on paper. This method not only makes drawings of plan and elevation intelligible to the child's mind, but also unconsciously develops the sense of geometrical proportion. So is carried out the principle that the development of the child is the object, and the work the means of attain-

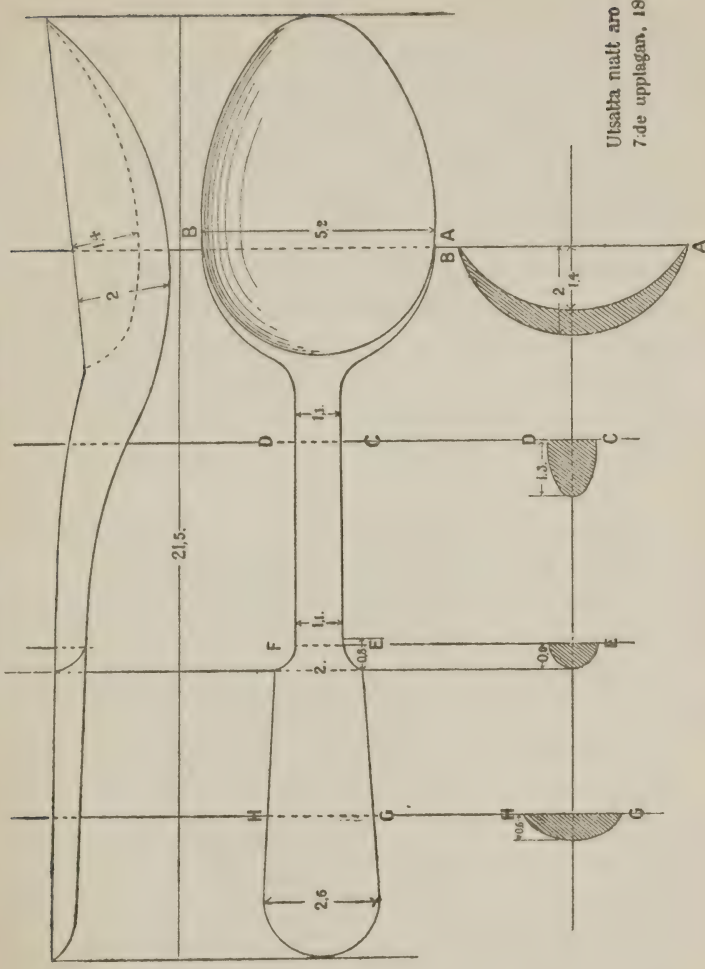

PLATE 62.—A SLÖJD WOODEN SPOON.

ing it, but in order to attain it, the work must be as perfectly executed as can be expected from each individual child.

One of the cardinal principles in Swedish slöjd has always been that the completed model, having been found to measure accurately in all respects, becomes the property of the pupil, and the pride with which a child brings home a small stool or even a pen handle or wool winder, when it has been passed and stamped, is a most important factor in not only the life of the child, but one of the first steps towards making him an interested and observant citizen, taking a pleasure in accomplishing anything thoroughly, and may enable him to help others less gifted than himself.

Herr Salomon says :

" Slöjd is a means of formative education. Let us examine this term a little closer. Different schools of thought regard the question of education from different standpoints. Three of the principal we will briefly consider, viz. (*a*) the utilitarian, (*b*) the disciplinarian, and (*c*) a compromise between (*a*) and (*b*).

" The advocates of the first class look upon education from a utilitarian point of view, and assert that most stress must be laid upon giving children that knowledge and dexterity which is useful in life, hence an acquaintance with the use of tools, and the cultivation of a general dexterity of hand, should be the chief aims sought after in a system of manual work.

" The disciplinarians regard it from the opposite point of view. It is not so necessary, say they, to impart information and cultivate

specific dexterity, for these may be forgotten, and hence stress should be laid upon the proper development of the powers and faculties of the child. This is formative education.

" The advocates of the third class say that while the proper development of the powers and faculties should be the main object, yet this development should take place through subjects practically useful in everyday life. This, then, is a combination of the utilitarian and disciplinarian, but embraces less of the former than the latter.

" All instruction may be regarded as partly formative and partly utilitarian ; but in certain subjects more stress is laid upon one branch than upon the other."

The more we study children, the more we are convinced of the truth of Froebel's axiom : " The child is not born to think, but to do and be active."

The worst thing one can do to a child is to insist on its keeping still for any protracted period, and it is directly contrary to all Nature's teaching. If a child keeps quiet it is usually a sign that it is out of health. Movement, therefore, is the normal condition of young life, and is absolutely essential to the rapid physiological changes which take place in the young body.

Hitherto the child has been regarded merely as a machine, and the idea appears to have prevailed that the harder the machine could

be driven, the higher the education that was accomplished. For all practical purposes, the fact that the child is a living and growing organism, depending every hour upon his environment for his development and progress, has been altogether lost sight of. While it will be readily acknowledged as a theory that life in the true sense cannot be maintained without vigorous and healthy blood, and that blood must, in its turn, be maintained by digestive and respiratory processes, which demand activity and pure air, yet, as a matter of fact, the children's muscles are allowed to waste, their bones to become distorted and bent, their backs crooked and their chests contracted, their appetite ruined and their sight overstrained, in those processes which are comprised in modern times under the misapplied term of education.

From this it will be evident that when a child begins to go to school, and is kept several hours in a schoolroom and is expected to sit still, the confined air and restricted movement will tell very seriously on his physical development.

Plate 63 is taken from a work of Dr. Schiotz, head of the School Medical Department for Norway, which is liberally illustrated with photographs of children and young people in connection with his elaborate researches on the relationship of height, weight and age;

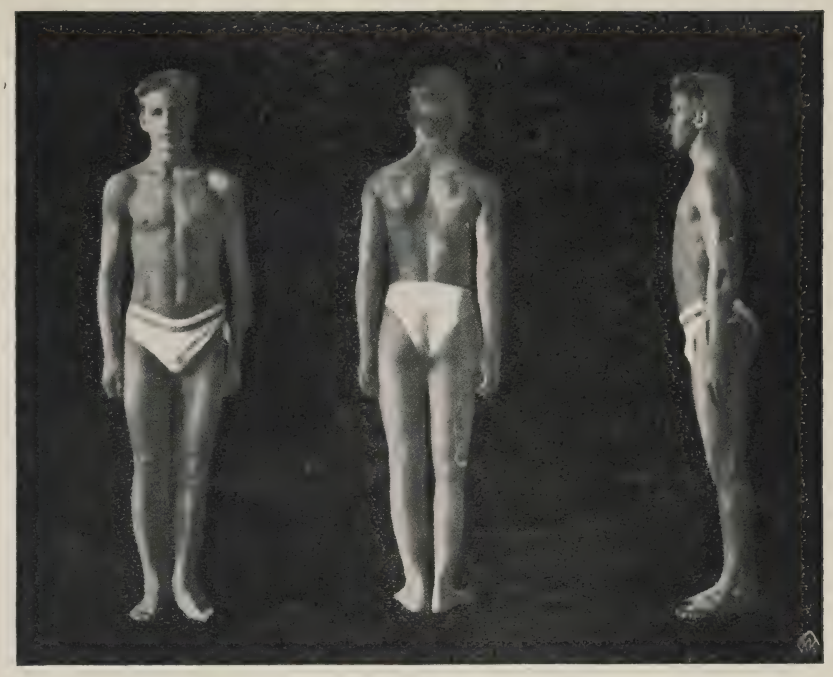

PLATE 63.—FROM DR. SCHIÖTZ' WORK.

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showing in each case front, back and side views. These figures present a pleasing similarity to those of the Swedish slöjd boys, page 203.

Vanity and ostentation may not be in themselves desirable characteristics, but Dr. Schiøtz, who is not only a charming man, but a skilled physician and a sound philosopher, with all the ability of the true strategist, turns even the most unfavourable features of his field of battle to good purpose. He laughs heartily as he dilates upon how he enlists the co-operation of the parents and the children by different coloured cards, gilt stars, and other marks of distinction, for those who are making good progress in his Open-air Malnutrition Schools.

The children are arranged in groups of 5 to constitute a family, and the child whose "red line" rises highest on the chart is the father or mother for the time being, while those whose "red line" shows less progress are regarded as the children and the maid.

In all great questions such as raising the status of humanity we must have the co-operation of the governing and the governed, and certainly the loving sympathy of Dr. Schiøtz has solved the problem, for teachers, parents and children whom we met during our visit were working together cheerfully and happily for the great commonweal.

Visiting one of his Open-air Malnutrition Schools in the middle of winter, when the snow had been on the ground for several months, we found a number of children seated at their desks fully clothed, hats and overcoats, and their feet in large straw overshoes, one side of the room being completely open. Off the classroom, there was a large shed provided with iron bedsteads and wire mattresses.

The children are usually in the school from 9–5; they get 4 meals and drinks of warm milk in addition. They lie on the beds for an average of 2 hours, covered very warmly.

Every child has a chart, showing height, weight, age, etc., on which a red line indicates progress. Teachers and children were all cheerful and happy, and seemed most keen and alert, not only in their studies, but also to attain the normal standard of health.

Dr. Montessori's System

Personally I feel that I could not too strongly recommend Dr. Montessori's method, as she administers it, in the case of all young children, but I must confess to very grave apprehension as to the possibility of obtaining anything like a sufficient supply of competent teachers, and it appeared to me when carefully reading and re-reading Dr. Montessori's work, that she had herself experienced this difficulty, and had been disappointed more than once even in those

whom she had the opportunity of training herself. Dr. Montessori, from her anatomical and physiological knowledge, not only understands the growth and development of the neuron, but also that this can only be brought about and controlled through the senses in conjunction with the best conditions of general health obtainable, and that the most important factor in its accomplishment is the personality of the teacher, comprising appearance, voice, accent, manner, movement and above all an affectionate heart and sound principle of consistency and practice.

The silence and blindfold lessons are particularly good, as here we can procure the development of the dendrites, gemmules and collaterals (see pages 105–115) in a way that cannot be attained while varied stimuli of sight and sound render absolute concentration on one group of sense impressions impossible, even though the child may be quite unconscious of any distraction at the time.

The results of her method of teaching writing demonstrate what can be done where we understand the fundamental principles which underlie our work. Her grasp of the neuronic control of muscular co-ordination enables her to accomplish well, and with pleasure, in a few weeks what those who will not accept the teachings of physiology take years of laborious struggle to do very indifferently.

I do not know of any scheme which holds out so hopeful a prospect of laying a good foundation, for the development of concentration in early childhood.

The Dalton Plan

The distinguished exponent of "The Dalton Plan" says:

"It is not a system or a method, which through ages of use has petrified into a monotonous and uniform shape, to be branded on to succeeding generations of pupils as sheep are branded on going into a fold. It is not a curriculum, which, all too often, is simply the machine by means of which the brand is stamped upon the individuals caught in the meshes of the system. Practically speaking, it is a way of educational re-organisation which reconciles the twin activities of teaching and learning. When intelligently applied it creates conditions which enable the teacher to teach and the learner to learn. In order to apply the plan it is not necessary, or even desirable, to abolish classes or forms as units of organisation in the school, nor the curriculum as such. The Dalton Laboratory Plan preserves both. Each pupil is classified as a member of a form and for each form a maximum and minimum curriculum is drawn up. But at its inception it lays the whole work proposition before the pupils in the shape of a contract job. The curriculum is divided up into jobs and the pupil accepts the task appointed for his class

as a contract. Though dispensed with above middle school, the younger children are expected to sign a definite contract, which is returned to them as soon as the job is completed.

"I....., pupil of ..... standard (form), contract to do the ..... Assignment.

"Date and Signature."

Daltonism and Montessorism both aim at giving the pupil more freedom physically, mentally and morally, and as long as you have a Parkhurst or a Montessori as teacher, they are undoubtedly very excellent methods calculated to do much in developing individuality and self-reliance, but it would appear to me that they both require a higher order of personality than it is reasonable to expect you can obtain, even under the most favourable circumstances, in the large number of teachers which will be necessary to handle the education of some hundreds of thousands of children in the board schools, and it is only too evident that if indifferently administered by those whose minds are neither well disciplined nor watchfully alert, liberty will easily degenerate into licence, and children who have for some years followed their own whims or fancies in whatever way seemed best to themselves at the time, are likely as adults to prove not only unreliable but may become a very serious danger to themselves and to society at large. Freedom, if not controlled by sound judgment and

experience, is quite frequently an active factor in producing serious consequences. If, for instance, a child has found a comfortable but twisted or crooked position, he will persist in it wholly unaware that he is laying up trouble for himself which in a few years will become irremediable, and hamper his effectiveness for the rest of his life.

We have already pointed out the consequences of these postural deformities (see pages 61–65 and 204–206). We see only too many examples in every public assembly in these countries, but their rarity in Scandinavia is to our eyes quite remarkable, and may justly be attributed to the thorough training of all teachers in their most excellent system of gymnastics, together with the individual contact of teacher and pupil in slöjd classes, which renders them watchful and alert to the earliest departures from the normal.

I regret that it is necessary to emphasise this point, as our teachers have not hitherto been trained to give it any attention and ignore the serious results even when they are perfectly obvious.

As far as I understand the Dalton Plan, it aims at introducing into the schools, conditions somewhat analogous to those existing in universities, but it should be borne in mind that at the age the student enters the university, he should have completed or nearly completed, the processes of growth of both body and brain,

while in the schools these processes should be at the height of their activity.

The children in the "laboratories" are encouraged to prosecute their investigations according as their fancy may direct, and to have free recourse to numbers of books; in fact, it would appear that one of the objects of the Plan is to foster what we may be permitted to call the research type of mind. Now research is exceedingly fascinating and stimulating and those engaged in it have a tendency to become anxious-minded and restless, especially in their sleep at night, and quite commonly lose weight and suffer from irritability. All these are the very conditions from which we should strive to protect the child.

Children are extraordinarily ambitious and usually very vain, and I am sorry to say I have known many of them bring on meningeal attacks which were only too evidently caused by their anxiety to excel others, and to become the observed of all observers.

The conviction has grown upon my mind for some years that it is our duty to discourage whatever might tend in this direction, and to check everything that may have any element of stimulation or competition.

The abolition of the time-table has much to recommend it, if we have thoroughly competent teachers and children who are already somewhat disciplined and orderly; but here, again,

there is a danger of liberty being abused, and degenerating into procrastination and dawdling, if the teacher is unobservant, or what is known as " easy-going."

We must not forget that punctuality is of the greatest importance in after-life, and that the abolition of the time-table is removing one of the most active factors in acquiring this most needful habit, which is just as important for the teacher as the pupil. After all, the " big brother " and friend attitude does not cover the whole ground, and children require to realise the importance of absolute, unquestioning obedience and punctuality without argument, which they will scarcely accord to the big brother.

It seems to me that the advantages of the Dalton Plan are possessed by the slöjd system, with which there is much less danger of becoming desultory and procrastinating. Undoubtedly teachers may find great relief in working the Plan, as we all dislike being bound to times and seasons and sharply defined duties, but there seems a likelihood of its being too stimulating towards the abstract.

The satisfaction expressed by both teachers and pupils is very encouraging, but we must recognise that all humanity, whether young or old, naturally loves to do as it likes, when it likes, and how it likes, and it remains to be seen whether young people who have grown up

with so much freedom become useful members of the community, when they have to suborn their wills to others' and are required to obey orders which seem to them unreasonable, both as to time and method.

Pedagogy has been justly charged with vagueness, romanticism and, particularly, inadequacy, which are just the characteristics that have wrecked the lives of many well-meaning and talented people.

CHAPTER XVII

DAILY LIFE OF SCHOOL-CHILD

"O little bulb uncouth,
Ragged and rusty brown,
Have you some dew of youth?
Have you a crimson gown?

"Plant me and see
What shall I be,
God's grand surprise
Before your eyes."

LET us now for a moment glance at the daily life of the average school-child, and see what steps we are taking to bring about the development of these component factors which are necessary for the maintenance and progress of our people.

We will take a child of 9 or 10 years who lives in a single room in a tenement house. His mother is still a young woman, who learned geography and grammar and kindred subjects at school, but never got any systematic instruction in cooking in her life, has never heard anything of the comparative value of different kinds of foods, never was taught to scrub a floor or make a jacket or a dress, and who, if a table or a chair is falling to pieces, could not drive a nail straight to keep it to-

gether. She has no idea of the importance of ventilation, and was never taught to hold her head up or to expand her chest. She is depressed and discouraged by the consciousness of her own inability to deal with the increasing desolation by which she is surrounded, and flies for refuge to the seductive tea-pot, which is constantly simmering by the smoky, dust-choked fire, and from which she derives, no doubt, a stimulant, but also a sure, though slow poison. Someone will reply that we have nothing to do with the mother, that we cannot alter her now, and that I am wandering from the point. I think we could do a great deal for her, and that the machinery is at our hands to do it if we would only open our eyes to see it. I have, however, only introduced the mother to show that there is nothing to be expected from her, and that if we are to do anything for the child it must be while he is in our own hands.

This poor child's breakfast will consist of a little white bread and butter, or margarine, and tea. Now the growing tissues of the child require a very large supply of nitrogen and phosphates.

Haig says growing children require at least 33 grains of nitrogen for every lb. of body weight per day.

The white bread contains probably less than 1·6 per cent. of nitrogen and practically no

phosphates, and the tea contains zanthine, which is rapidly converted into uric acid. Yet with no further provision the child has to start for school, where he will begin his work at 9·30 to 10 o'clock. He is then in the schoolrooms for 2½ to 3 hours, with a large number of other children (who probably like himself are almost wholly innocent of soap and water), many of whom are centres of infection, either directly or indirectly. The air grows heavy and fœtid, and the child becomes listless and inattentive, and, standing or sitting, twists his body into whatever position will give his weary little muscles the most ease for the time being, and thus begins to establish incipient spinal curvature and other deformities.

He returns to the schoolrooms for another 2 or 2½ hours to listen to, or take part in, the dreary recitation of lessons, most of which are wholly of an abstract nature, and are not, and cannot be, made the least interesting, and which will at the best only force the child through an examination without doing anything whatsoever to equip him for the battle of life.

Many of these children spend from 4½ to 5 hours every day in unhealthy and crowded schoolrooms, and many teachers are there 6 hours or more. Is it to be wondered at if, during the last few hours, both teachers and children are irritable and longing to escape, and that the children not infrequently look

upon the teachers as their natural enemies, and seize every opportunity of resisting their authority, and, finally, that both teachers and children get home too jaded to eat their dinner, or if they do eat it, they certainly have not the nerve-energy to digest it?

Now every step in this daily history is not only unphysiological, but is directly contrary to all physiology; we blame the Egyptians for expecting the children of Israel to make bricks without straw, and yet we expect children to build brains without sufficient food or pure air. We burden and break down both teachers and children by making excessive demands upon their memories and their endurance, and we do not supply them with the means of strengthening either.

At certain periods, what are called examinations are held. Are the examiners capable of examining children? Have they made any special study of the brain in childhood? Are their minds really occupied with the children and the teachers, or are they crowded out by long lists of questions and answers, marks and percentages, and the complicated regulations and instructions of their boards and committees, who know nothing about the individual to be dealt with? How many examiners could tell you whether a child's eyes were dull and leaden or unduly bright and nervous? I have known some of them mistake the bright

eye and flushed cheek of tuberculosis for positive enjoyment in the examination. The examiner has not been taught to observe such things or to draw any conclusion from them if he did observe them. He will tell you he has no time, his board will be down upon him if he does not make his district show as good a percentage as other districts, and if the child breaks down as soon as it leaves school he cannot be held responsible, and he has no time for anything else. Nobody has any time, everybody is overworked and feels that much of the work is worse than useless.

Is it any wonder that the civilised nations of the earth are usurping our place? Just look at our coinage, and our weights and measures, to begin with. How many children are annually driven mad or epileptic by our compound addition, compound multiplication, compound subtraction, compound division, and all the other compounds and complications that must arise from our 4 farthings in a penny, 12 pence in a shilling, 20 shillings in £1; or 12 inches 1 foot, 3 feet 1 yard, 1,760 yards 1 mile, etc.?

How many years of worse than useless toil have been spent over all this which has been long ago wiped out in other countries by the decimal system.

Even in our thermometer we adhere to the Fahrenheit scale with freezing point 32°, boiling point 212°, not only the most clumsy,

but the most obstructive for all purposes of calculation.

The educational value of an idea is its capacity for association and suggestion, and hence in the metric system each unit as it occupies a definite relationship to the whole of the rest of the system is of considerable value in this respect, while in the conglomeration of incoherent delirium of our table book, each isolated fact stands out independently and bears no relationship to anything else in the universe, unless indeed, it be one of an adverse and injurious nature, to the unfortunate child who fails to retain it in his overstrained and exhausted memory.

Does it not in a great measure explain why we frequently find ourselves sitting upon an Austrian chair, eating bread made of Californian flour, butter from Denmark, cheese from Holland, that the lamp chimney is from Saxony, that we write upon German paper, that we cut our grass with an American lawn-mower, that the tram rails in our streets are made in Belgium? While other countries are manufacturing everything for our daily use, we are, too often, manufacturing anæmia, tuberculosis, epilepsy and insanity.

Examinations

As the complexities of social problems have evolved themselves out of the confusions of

barbaric ages, it has become necessary to standardise by some method, more or less efficient, the capacities of certain members of the community to undertake the responsibility of definite classes or groups of duties, so that the rest of the community may be left to devote itself to such other duties as may be demanded in turn from it. This method of establishing a standard has brought about the system which is generally known as examinations, and many and diverse methods of conducting these examinations, all more or less faulty and defective, have been carried on all over the world. It is not possible here to enter into all the varieties and changes which have been brought about by the ever-present consciousness of the shortcomings, which are only too manifest in the results of the different systems adopted; neither, indeed, would such investigation of mere varieties of detail serve any useful purpose. It will, however, be observed that the tendency is to make the examinations of more frequent occurrence in the various courses laid down in our schools and universities, and rather to extend the actual time spent in the examination, whether it be written or *viva voce*. We believe that this tendency is in the right direction, but we are quite convinced that it has not yet been extended to its full limits of usefulness. For instance, it is not possible to form a really sound estimate of the efficiency

of the candidate from the present system, and that in the expressive words of the Alumnus, "There is a great deal of luck about exams." It is our duty to eliminate this element of so-called "luck" as much as possible, and we would, therefore, suggest that the decision as to the pupils' progress should rest more with the teachers. In other words, we feel that the whole term should be an examination, and that marks should be recorded every day or every week, or in the case of classes which were infrequent, at least once a month, and that the accumulation of marks should constitute the basis for granting certificates. In this way the apprehension on the child's mind would be reduced to a minimum; each week's work would be finished on Friday; Saturday and Sunday would be free from care and anxiety. Many thoughtless people have no idea how seriously "coming events" which "cast their shadows before" affect the child; children are not by any means as careless and indifferent as they are often supposed to be, and the effort to suppress their anxiety is most damaging to the metabolism which should be at the height of activity.

In Sweden, school examinations have been abolished for some time, and there is a strong feeling in favour of also doing away with them in the universities. I am happy to say that a similar disposition shows itself in these coun-

tries, and there is a growing tendency to make a record of daily marks supplant the term examinations.

Huxley speaks of competitive examinations as being "the abomination of desolation," and all medical men who see their consequences feel called upon to protest.

A few cases from my own notes may serve to illustrate the serious nature of the position.

H., aged 13, male, tall, slightly built, very pale, brought by his father on account of failing strength and general debility, was told he must give up school, go to the country for at least a year, and work on a farm. The father replied that this was impossible as he had taken a scholarship of £20, and must pass up to the standard next year in order to retain it. He was given a tonic, but was told quite plainly that the school work was killing him. He did not present himself again till after 12 months: he had held his scholarship and taken a further prize of £2, but was then dying of fully developed tuberculosis, which terminated about two months afterwards.

G., aged 13, female, had distinguished herself at several examinations, was very ambitious, and so anxious that she frequently rose early and worked late at night, in which she was encouraged by those who ought to have known better. Became restless and sleepless, began to complain of pain in the head, and died after

suffering two months of the most horrible agony of what was certified as tuberculous meningitis.

S., aged 16, female, preparing to become a primary school teacher, worked very hard for an examination, after which she seemed tired and depressed for a couple of days, was supposed to have a cold. When I was asked to see her, her temperature was 106° and her pulse 130. She was dead in a few days, cause certified being pneumonia. This was a simple case of neuronic bankruptcy, in which the accumulation of the poisonous products of fatigue produced fever and death.

L., aged 11, male, had worked very hard and gained honours at his examinations, seemed seedy and depressed. Was sent to friends in the country where, on his arrival, he complained of pain in his head, became drowsy and unconscious, died in a few days, his death being attributed to abscess on the brain.

It is, of course, unnecessary to point out to my professional brethren that cases of death from exhaustive conditions display a pneumonic syndrome of rapid breathing, quick pulse, high temperature, probably pulmonary dullness and even hæmorrhagic sputum, and as the pneumococcus is widely distributed, it would almost certainly be found in the sputum, consequently these cases have to be registered under the heading " pneumonia " in accordance with directions as to nomenclature laid down

by the authorities, although we are perfectly well aware that the pneumonic state is the consequence and not the cause in operation.

With the exception of cases of violence or accident nobody ever dies suddenly. The principle of life with which the Creator has seen fit to endow humanity is extraordinarily resistent and tenacious and contests every inch of the ground before it will yield to the inroads of pathological influences. The only true heading under which to register quite half the deaths of young people in these countries would be, primary, prolonged pathological conditions in school and home life, and secondary, examinations.

The whole of this unfortunate story is, however, not yet told. Death is inevitable and although it is manifestly our duty to take all available measures to ensure as prolonged a period of active usefulness as possible, yet we all recognise that this stage of our existence must have such a termination, and if the child's nervous system be exhausted, and normal metabolism has become an impossibility, then speedy death is probably the best solution of the difficulty. But in far too many instances the pathological state expresses itself in outbursts of criminality or lunacy, which must inevitably result, sooner or later, from the failure of the self-conscious pathological entity to re-establish physiological relationships with its environment.

Efficiency must ever be the great aim of life, as thereby alone can man justify his claim to be a worthy factor in a great working universe of power, beauty and joy; but this work, with its resultant of power, beauty and joy, can only be maintained upon physiological lines, for all pathological conditions are antagonistic to universal law and hence self-destructive. It is, therefore, evident that if we would rescue our people from quite unnecessary suffering, we must accept the truth, however unpalatable, and surrender the short-lived éclat of examination distinctions for the greater permanency of adult efficiency.

Huxley says:

"Above all things, let my imaginary pupil have preserved the freshness of youth in his mind as well as his body.

"The educational abomination of desolation of the present day is the stimulation of young people to work at high pressure by incessant competitive examinations. Some wise man (who probably was not an early riser) has said of early risers in general, that they are conceited all the forenoon and stupid all the afternoon. Now, whether this is true of early risers in the common acceptation of the words or not, I will not pretend to say, but it is too often true of the unhappy children who are forced to rise too early in their classes. They are conceited all the forenoon of life, and stupid all its afternoon. The vigour and freshness which

should have been stored up for the purposes of the hard struggle for existence in practical life have been washed out of them by precocious mental debauchery—by book gluttony and lesson bibbing. Their faculties are worn out by the strain put upon their brains and they are demoralised by worthless childish triumphs before the real work of life begins."

Herrick says:

"Many a boy's brains are curdled and squeezed into traditional artificial moulds before he leaves the grades at school. His education is complete and senile sclerosis of the mind has begun by the time he has learned his trade."

Relationship of Adolescence to Adult Potentiality

Plate 64 is a diagrammatic representation of the relationship which has been found to exist between the period of adolescence and adult

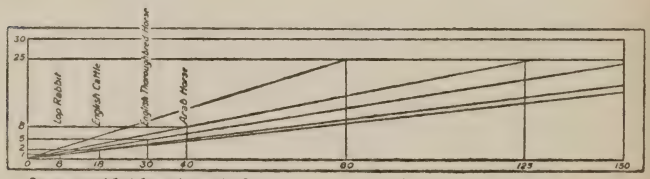

Diagram modified from the work of W. Ainslie Hollis, M.W.

Plate 64.

"Happy is the man that findeth wisdom . . . length of days is in her right hand . . . she is a tree of life to them that lay hold of her."

potentiality in animals and man. The vertical line on the left side represents the period of growth, while the horizontal one shows the average period of adult life. The diagonals of the parallelograms which are produced indicate how very far short the life of man falls of that which he is entitled to expect from all biological analogy. It is, in fact, not too much to say that, as soon as a child is born we begin to kill it.

Flurens concluded that the average age in mammals was five times the period occupied by growth, but Buffon considered it to be seven times as much.

According to Ainslie Hollis :

" The potential longevity of a domestic mouse is about $4\frac{1}{2}$ years, whilst it is full grown at the age of three months ; the mouse, therefore, spends about 18 times the span of its growth as an adult animal. When an animal is taken for comparison, such as an Arab horse, whose youth, though longer than that of the mouse, is shorter than that of a man, the ratio of the two periods is as 8 years to 40, that is 1 to 5, so far conforming to Fluren's requirements."

In man the period of adolescence or of complete growth cannot be considered to be consummated till between 25 and 30 years. Julius Althæus states, on the authority of Professor Carl von Bardleben, of Jena, the editor of the *Monumental German Handbook*

of Anatomy, that he has found union fully established in the sternum at 28 years only, and in the sacrum and coccyx, 30 years. He considers that the human skeleton is only fully finished at from 35 to 40 years of age. Yet, if we multiply even the lowest of these figures by the ratio suggested by Flurens we get 125 years.

It therefore appears evident that there is within the human race the possibility of a very much more prolonged period of adult potential activity than it at present enjoys.

CHAPTER XVIII

"BY THEIR FRUITS YE SHALL KNOW THEM"

I SPENT some months in the year 1924 in Scandinavia investigating their educational and social systems and was much impressed by the following figures.

Sweden, with a population of 5,929,403, had a total police force of 3,547, of whom 300 were not acting as police, but as Government clerks in readiness if necessary to be called up for police duty.

The number of persons in police detention was given as 2,125, which you will see works out at one police officer to 1,672 of the population, and one prisoner to 2,789, and when we consider that just across the Baltic, Bolshevist Russia was steeped in blood and crime and that propagandists were active, in season and out of season, in endeavouring to spread their noxious doctrines over a population, who, like the rest of the world, are in that restless state of psychological disturbance, one of the inevitable consequences of the aftermath of the Great War, I think it must be admitted that these

figures should make one pause and think when we compare them with those of our own country.

England, with a population of 39,884,950, has a police force of 56,945, and the number of persons in police detention, 46,126, works out at one police constable to 665 of the population and one prisoner to 821.

Now we cannot see any sufficient reason to believe that the moral tone of the Scandinavian is intrinsically on a higher plane than that of the Britisher, and, therefore, we must seek for an explanation of the discrepancies between these figures in another direction, and the more we look into the matter the more we are struck by the higher order of general well-being pervading all classes and the small percentage of poverty, deformity and physical incapacity, and this is the more remarkable when we consider that the geographical situation and features of the country concerned are naturally of a discouraging and difficult nature.

In Sweden enormous areas are under water, or are bare, uncompromising, unproductive masses of rock, and the climate is often of the most inhospitable nature for at least six months in the year; and yet we find these people not only maintaining a very high average of prosperity and happiness, but also a high order of intelligence, and commanding the respect of the civilised nations of the earth; and exporting to other countries, such as our own, products

which from our geographical position and fertile soil we should be better able to supply, not only to our own markets, but to many of those throughout Europe. We are, of course, fully aware that there are a number of factors always in operation to bring about any great result, but it must be admitted that, upon the whole, mankind is fundamentally much the same in all ages and in all countries, and if, then, we find any one section standing out prominently from the rest in any particular, we are forced o come to the conclusion that there is some good reason, either for development on the one hand, or for deterioration on the other. Herbert Spencer has well said :

" It is one of those open secrets which seem the more secret because they are so open, that all phenomena displayed by a nation are phenomena of life, and are dependent on the laws of life."

Now we have seen that the metabolic capacity of an individual or a nation is the measure of the possibility of efficiency for either the individual or the nation. C. L. Herrick says, " Life is the correlation of physical forces for the conservation of the individual." In other words, man is a great force transformer, especially in early life, and hence the most simple way of approaching the question is to consider, (1) the sources from which we derive the

force, (2) the condition of the transformer, and (3) the control of the force when transformed. It is precisely along these lines that the Scandinavians have made such a success of their educational system, while, unfortunately, in these countries the sources of the force in question and the condition of the transformer have been taken for granted, with the inevitable result that the transformed force has been irregular and unreliable, and although in individual cases satisfactory results have come about, yet it is evident from the foregoing figures very much is left to be desired.

Now it ought to be manifest without further argument that the more efficient people are in life, the less likely they are to become prisoners or paupers, and hence the greater number of efficient individuals in a nation the smaller the number of police that will be necessary. The importance of efficiency cannot be too much insisted upon, as from every point of view it not only tends towards the progress and happiness of a people, but, on the other hand, to the reduction of crime and the expense of government. Herr Salomon, who was a gifted educator, always insisted that if you failed to interest a child you failed to educate him. Unfortunately, we only too often see children who pass through their whole school life without ever being really interested in anything, and also men and women listless, indifferent, in-

attentive and careless, who never have known the satisfaction of accomplishing anything in a sufficiently creditable manner to satisfy the organic need, or raising themselves or their fellow-man even ever so little in the scale of creation, but fall only too easily a prey to the active powers of evil, who are always on the alert to seize any empty house swept and garnished, and whose triumph it is to leave the last state of the individual or community worse than the first.

The police are a most admirable body of men, deserving of the utmost possible respect and support, and judging from what we see round us, and all we can gather of the psychological condition of our people, we cannot at present dispense with one of their number, but we must remember that the police cannot be regarded as a productive body, and that every policeman is a useful man lost for either agricultural or industrial purposes, so that we are justified in looking upon every policeman as counting two against the country, that is, he is one off the credit side and one added to the debtor side of the account. It is, perhaps, not too much to say that every lawyer, under which heading we may include the police, and every doctor and every soldier, is only a necessary evil, and is a painful evidence of how far man has fallen short of the goal for which he was created.

The object in entering into so much detail in examining the case of the mother, the health of the child, the school buildings, etc., is to direct attention to the intricacy of the mechanism of the transformer and to suggest the measures necessary for maintaining it in good condition or restoring it should it have become damaged. In air, light, food, etc., we deal with the great sources of the force, while the committees, training colleges and teachers are the means by which we must try to place ourselves in the best possible position to direct the control of the force which has been transformed.

Definitions

"Howbeit that was not first which is spiritual, but that which is natural, and afterward that which is spiritual."—1 Cor. xv. 46.

Up to the present we have been principally occupied with the physical considerations bearing upon the development of the mechanism by means of which the ego places itself in communion with its environment and have only touched very lightly on the psychological aspect where we felt the physical was more or less directly under its influence.

Man is a compound being, but his component parts, physical, mental and moral, are inextricably interwoven and cannot be shut off in water-tight compartments.

We have endeavoured to show that the physical development must take place first, and that upon the care and wisdom here exercised much of the subsequent mental state will depend, and we have suggested that the moral result, which is the goal of all true education, is in its turn dependent upon the mental capacity to realise responsibility and appreciate the consequences and relationship of any action taken, and under this word action I would like to include not only our words and deeds, but also our thoughts, for we are only too ready to forget how much our thoughts influence not only our fellow-man, but also what we call the lower animals, and even vegetable life with which we come in contact.

It is not easy to lay down anything like a satisfactory definition of what we mean by the word "mind"; indeed, definitions are generally unsatisfactory; if they are comprehensive they are likely to be too long, and if they are brief they are likely not to be comprehensive enough, and as words do not always convey the same meaning to different people, it is not possible to be at all sure that we ever convey our meaning clearly and fully to another. Nevertheless, I am in favour of definitions, for with all their imperfections, they, as a rule, throw a light on words from a somewhat different point of view to that which is taken for granted in their

commonplace use, and for practical working purposes I have often found it of advantage, with my students, to define the particular sense in which I proposed to use a term, even when of a technical nature where one would suppose misunderstanding to be less likely to occur.

In the present connection, therefore, if we define mind as external stimuli plus the brain of the individual, I think it will be found helpful, for we will then see more clearly our responsibility, not only to develop the brain in the most comprehensive manner possible, but also to regulate and control the force and incidence of the external stimuli.

The water in a stream may be muddy and unsatisfactory, yet if we boil it and filter it, we can obtain a life-giving drink capable of bringing health and happiness to the suffering and the dying. Now the water is the external stimuli, the boiling is our modification, the filter is the brain, and the result is the mind; if the water be not boiled or the filter is unclean, then the drink may be repulsive or poisonous instead of life-giving and grateful. And in a parallel manner a similar group of external stimuli can produce the most opposite results according to the modifications of their incidence and the condition of the brain which receives them.

Herrick says:

"The functions of the cerebral cortex are

twofold. (1) Correlations of great complexity. (2) Retentiveness of past individual impressions in such form as to permit of subsequent recall and incorporation into new stimulus complexes.

"These two functions lie at the basis of all mind."

It is hardly conceivable that the 9,200,000,000 cells in the grey matter of an ordinary brain with their dendrites, gemmules, collaterals and the constant variation of threshold resistance at the numerous synapses, etc., can give an identical response to a similar group of external stimuli applied to different individuals, when even the senses, sight, hearing, feeling, taste, smell, etc., can scarcely be expected to be in precisely the same condition of receptivity, so that to merely glance superficially at the subject is sufficient to show that many men must be of many minds, but as long as the mind of the individual is able to adjust itself satisfactorily to the position, accomplishing what is required of it to the benefit of the community and without injury to himself, we must consider him in this respect an educated man.

There have been many attempts made to define education, but here again with only indifferent results. We read that Milton's description of a complete and generous education is "that which fits a man to perform justly, skilfully and magnanimously all the duties of all offices." Huxley with his usual wonderful

facility has gone into fuller details (see page 97). Dr. Montessori says, "Education is the active help given to the normal expansion of the life of the child," while in Miss Parkhurst's work on the Dalton Plan she tells us it is "learning to learn."

Some people would tell you that it meant going to school and college, some that it meant passing examinations and getting degrees, while others, taking the derivation of the word, would tell you that it was drawing out qualities that are latent in the individual.

Now none of these explanations is quite satisfactory, for, although the last is probably the nearest to the truth, yet it does not fully satisfy the requirements of modern times, inasmuch as we not only want to bring out the faculties of the individual, but also to develop him in such a manner that by the use of what he already possesses he may acquire more. Some people may say that it is impossible to develop in an individual a faculty that he does not already possess, but this is manifestly incorrect, for a person who is deaf and dumb cannot be said to possess the faculty of speech, yet by the use of the powers of sight and muscular sense, he can, by a little ingenuity and training, be taught to speak very well indeed. It is, therefore, evident that by the use of two or more faculties we may acquire others, and as this capacity for acquisition

implies neuronic development and energy, it constitutes one of the cardinal points in all true education.

Education, to deserve the name, should enable us to give due value to all factors in the various complex problems of daily life, so that we may arrive at a correct solution and devise efficient means for dealing with the difficulties of the situation.

In the simple problem of the parallelogram of forces it is demonstrated that, when any two forces acting at a given angle about a point are represented in direction and extent by two sides of a parallelogram, the resultant of those two forces will be equal in direction and extent to the diagonal of that parallelogram. You will remember, if undue value be given to either of these forces, or the angle at which they operate is incorrectly represented, the resultant must necessarily be incorrect also. And we think it will be conceded that, in a similar manner when seeking a solution of everyday difficulties, our judgment can only prove itself correct when our estimate of the importance of the various factors concerned has also been correct, and here perhaps I may be permitted to remind you of how we saw (page 110) that the correlation of mental faculties enabled us to correct our first erroneous judgment with reference to the pin-cushion which looked so like a pear.

This faculty of testing or allotting to our various observations their due relationship is the underlying principle of geometrical science.

Geometrical science, by dealing with the relationship of proportions, enables us to arrive at equilibrium, and as equilibrium is the physical equivalent of the moral ideal of justice and equity, it follows that a physical training which develops these faculties and senses, enabling us to estimate this relationship of proportion, must have a far-reaching influence upon our mental and moral natures.

Civilisation is the result of a progressive, selective appropriativeness; and progressive, selective appropriativeness can only be brought about by an appreciation of the relationship of proportions; hence our civilisation is directly due, whether we recognise it or not, to our appreciation of the relationship of proportion; in other words, to the "fitness of things" physical, mental and moral.

The locomotive steam engine is perhaps the best concrete example of modern progressive civilisation, and a moment's reflection will be sufficient to show that its efficiency depends upon the accuracy with which the proportions of the details are carried out. The size of the cranks must be proportionate to the length of the stroke of the piston. The capacity of the boiler must be proportionate to the steam which will be required; while, finally, no

matter how powerful and well constructed the engine itself may be, the solidity of the road must be proportionate to its weight or it will sink into the ground and become absolutely useless.

It is, in fact, a departure from this appreciation of the relationship of proportions which constitutes insanity and, on the other hand, that community which orders the mechanical duties of its daily life with the greatest geometrical accuracy and its moral relationships with justice and equity, will certainly hold a leading position amongst the nations of the earth.

We have seen that man is a compound being, and hence his development necessitates the development of his component parts. It may be impossible to attain to perfection, but, nevertheless, we must aim at it, and to ensure the perfection of a compound, we must begin by selecting perfect elements. A man who is morally and mentally as near perfection as possible cannot be said to be a perfect man if he is physically diseased, for, although his moral and mental characteristics are undoubtedly much more useful and to be admired than his physical, yet the physical are necessary for the maintenance of the moral and mental, and physical deterioration must inevitably be followed by dissolution, or at all events, decline in the moral and mental usefulness of the sufferer.

Let us take the analogy of a fruit tree; its highest function is to bear good fruit, but in order that it may do so it is necessary that its roots and leaves and branches be healthy, as, otherwise, it cannot continue to bear good fruit. It is not a well-developed tree simply because it bears a large quantity of fruit for one or two years and then fades and dies. In order that it may deserve the character of a perfect tree, there must be a due proportion between all its component parts which result in the greatest possible amount of the best possible fruit. The roots, the branches and the leaves, are not the object for which the fruit tree is cultivated, but they are necessary to it; and similarly, the physical and mental qualities of man are not the highest objects of his existence, but are most necessary to maintain and give effect to those moral qualities by which alone he may reasonably hope to glorify his Creator, and benefit his fellow-man.

But it must not be supposed for a moment that we have now got a complete picture of the ego; there is still the spirit to be reckoned with, and here we are on very difficult ground. I do not know that anything approaching a satisfactory definition of the spirit has yet been arrived at, and I would certainly not feel competent to attempt it. But I think we can claim that there is quite sufficient

evidence to show that careful training of the body and mind do much to develop "a right spirit within us." We have already seen that St. Paul has given us a definition of the fruits of the spirit, and as we also know from him, and have seen demonstrated in tracing the growth of the neurons, that "as a man thinketh so is he," we may be warranted in hoping that by following his instruction to "think on these things" we are laying a solid foundation upon which we may build a strong and healthy spirit. This is not the time or place to enter into a metaphysical analysis of the distinction between soul and spirit; even those who are most conversant with these terms do not seem decided as to the precise meaning to be ascribed to them. For example, in the Magnificat, "My soul doth magnify the Lord, and my spirit hath rejoiced in God my Saviour," would suggest that these words can be used synonymously; for our purpose here it will be sufficient to accept these terms as acting in unison and constituting the third factor in the make-up of the ego and being alike a cause and a result of not only the physical and mental, but also the moral relationships to environment of the individual, more especially during the period of growth and development alike of the embryo and the child, for although we fully recognise that the embryo and the young child are not psychological creatures yet they

respond most readily to psychological influence, which has been only too painfully demonstrated during the War, when many premature births and cases of mental deficiency were directly traceable to shocks received by pregnant mothers.

It is, of course, much easier to grasp the reality of the concrete than of the abstract, and yet all new adjustments of the concrete have at one time been abstract, and there is evidence to show that it is the spirit acting through the mind which determines these new adjustments of thought and action.

Whatever may be our concept of the spirit, we all know quite well that we can quench all that is good in it, and hence we must believe we can, on the other hand, do something to develop it. Pascal's pronouncement sums up the position briefly and forcibly, but in our own time we have it brought before us even more graphically by Stevenson in his wonderful delineation of Dr. Jekyll and Mr. Hyde, and it cannot be too strongly urged that all those who would take upon themselves the responsibility of making any attempt to educate the people, whether he be a minister of education, member of committee or board, or a teacher, should keep this marvellous picture of Jekyll and Hyde clearly before their minds, remembering that although the development of Mr. Hyde was slow and difficult at first, it finally

triumphed over Dr. Jekyll, and that horrible suffering and death were the inevitable consequence of tampering with evil, even from a research point of view, which might appear to justify the risk of the experiment.

If the physical and mental powers are not patiently and solidly built up, they will not be able to sustain the moral equilibrium under the pressure of temptation or disease, and hence, much that is noble and excellent in the culmination of this most imposing edifice, collapses in chaotic ruin ere the finishing touches can be given to the masterpiece, and we find, far too often, the hoary head which should teach us wisdom, a painful spectacle of despondent decrepitude, or blank and incoherent dementia.

We feel, therefore, that the best definition that has ever been given of education is that which Our Lord gave of His mission to mankind, "I am come that they might have life, and have it more abundantly." True education should be more abundant life physically, more abundant life mentally, more abundant life morally and spiritually. Then, indeed, would the eyes of the blind be opened, the ears of the deaf unstopped, the lame man leap as an hart, and the tongue of the dumb sing, and we would obtain joy and gladness, and sorrow and sighing would flee away.

CONCLUSIONS

THE following conclusions are suggested, and if it is felt that they are not justified by the evidence before us, it is hoped that investigations along these lines may be carried out to the utmost, for if the author has been instrumental in directing attention to the paramount importance of accepting the child as a physiological creature, and not as a mechanism to be converted into a locomotive phonograph, then he will feel that he has not lived in vain.

That as hereditary conditions have such serious consequences in life, all those who would assume the risk of parentage should realise their responsibility to generations to come, and do all in their power to give their offspring the best possible prospect of becoming useful and happy citizens, a blessing and help, not a curse and anxiety to their fellow-creatures.

That the experiences of the late war have shown that the psychic influences of the parentage are even more serious in their effect on the offspring than material circumstances, with the possible exception of actual specific disease.

That efficiency in life is based in the first place on the adjustment of metabolism and in

the second on the control and direction of the force transformed by that metabolism.

That this adjustment is under the control of the neurons in response to stimuli received from environment through the senses.

That all efforts of training in early life should be directed to the development of the neurons.

That this development depends upon nutrition and the development of the senses.

That nutrition is dependent upon air and respiration, the quality and quantity of the food, digestion, muscular efficiency, the action of the endocrinic glands and psychic influences which operate on all biological matter.

That the psychic influences most active in child-life are love and fear.

That it can be shown that love, joy, peace, long-suffering, gentleness, goodness, faith, meekness, temperance encourage the growth of the neuron, while on the contrary its development is hindered by fear, anger, envy, jealousy and malice.

That sense-training is best cultivated by duly regulated stimuli for short periods, well within the limits of nutrition.

That the whole question of management of schools and training of the teachers be recast.

That from Faraday's time to the present day, school education has been and still is, too abstract and theoretical and deficient in concrete experience and observation.

That the vast amount of scientific training which will be ready to give help should be made use of.

That although in a multitude of councillors there may be wisdom, yet there is often obstruction and delay also, especially if these councillors are preoccupied with other business, or prejudiced against innovation.

That the experience of senior teachers, as in Sweden, be made available in the Central Educational Board and in the Provinces throughout the country.

That architects, sanitary engineers, medical men and senior teachers be represented on all educational boards and committees.

That in training the teachers some system of practical instruction in the physiology of the child be arranged with the medical schools, local health authorities and children's hospitals.

That the great improvement in the condition of the school-child which has taken place since the introduction of medical inspection, suggests the advisability of increasing the powers of the medical department until they are, at least, on an equal footing with their confrères in Scandinavia.

That in view of the serious results of neglected postural deformities which for their correction require prolonged continuous treatment, every school must be provided with a gymnasium, which should be under the management of a

gymnast thoroughly trained in the Swedish methods.

That one such gymnast can work many schools, the hours being accommodated to her convenience, the gymnastic work being of paramount importance and allowed to take precedence of book lessons.

That every school be provided with commodious bathrooms, and all children obliged to have baths in the schools unless exempt by medical certificate.

That there be an interval in the school day of quite two hours, some time between 11 a.m. and 2 p.m., during which the teachers can have a meal and a rest, and are relieved of all responsibility, the children either returning to their homes or being in the charge of some retired teacher or other suitable person appointed for that purpose.

That a sleepy child should be encouraged to sleep. Many slum children get very little sleep as their nights are broken by drunken rows in the tenements all round, the crying and coughing of other children, banging of doors, loud talking and the noise of street traffic. Sleep in early childhood is even more essential than food. But the child must lie down and be comfortably covered, not lounge upon the desk or back of the seat. Many of the Scandinavian schools are provided with open sheds furnished with spring mattresses, bedsteads and

warm covering so that even in the depth of winter the children can rest comfortably in the horizontal position, relieving the strain on the heart and skeletal muscles and breathing fresh air.

That the Montessori system, if properly administered, is highly to be recommended in dealing with young children.

That Dr. Montessori is fully justified in her protest against the confinement of the young child to positions cramped by the restrictions of seats and desks, and that her silence and blindfold lessons are particularly useful in training the child's capacity for concentration.

That while we gladly acknowledge our indebtedness to Froebel's kindergarten, we must recognise that his principles are worked out in junior slöjd, with the additional advantage of continuity through the wood and metal slöjd and of directing the child's attention constantly to accuracy of measurement which unconsciously not only develops the power of concentration but also the mathematical sense of proportion.

That the Swedish slöjd system with its graduated paper, wood, metal, drawing, singing, gymnastics and games, gives freedom of movement and relief from the restrictions of the seat and desk, affords personal contact with the teacher, which in class teaching is reduced to a minimum, while the definite programme

retains the advantages of punctuality and discipline.

That the proportion of police and prisoners to the population in these countries when compared with Sweden demands serious consideration.

That while fully appreciating the educational value of books their contents are often too abstract for the child's mind, and that unless their statements can be practically demonstrated they are positively harmful until the mind has attained to sufficient experience to make apperception possible.

That there is more wisdom in the Scriptures than in any other group of books of equal volume.

That a short portion of Scripture, such as the Gospel or Epistle for the day, be read each morning without comment.

Huxley has written strongly on this point, having had painful experience of unwise comment. Ruskin said, " Make it the first morning business of your life to *understand* (not read only) some part of the Bible clearly; and make it your daily business to obey it in all that you do understand."

That the great aim of true education should be more abundant life, physically, mentally, morally and spiritually.

That the prevailing system of what is called education frequently results in more abundant

crooked spines, contracted chests, dilated hearts, stomachs and bowels, twisted limbs, damaged eyes, exhausted nervous systems, irritability of temper and unreliability of character.

That in human life the spirit is a greater power than the body, but that it can only be approached and maintained through the body and the mind, and although high ideals may be associated with defective physical conditions, yet such ideals cannot be as effectively expressed nor prove as useful to the community as when they participate in the grand consummation "More abundant life."

"Where there is no vision the people perish."

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